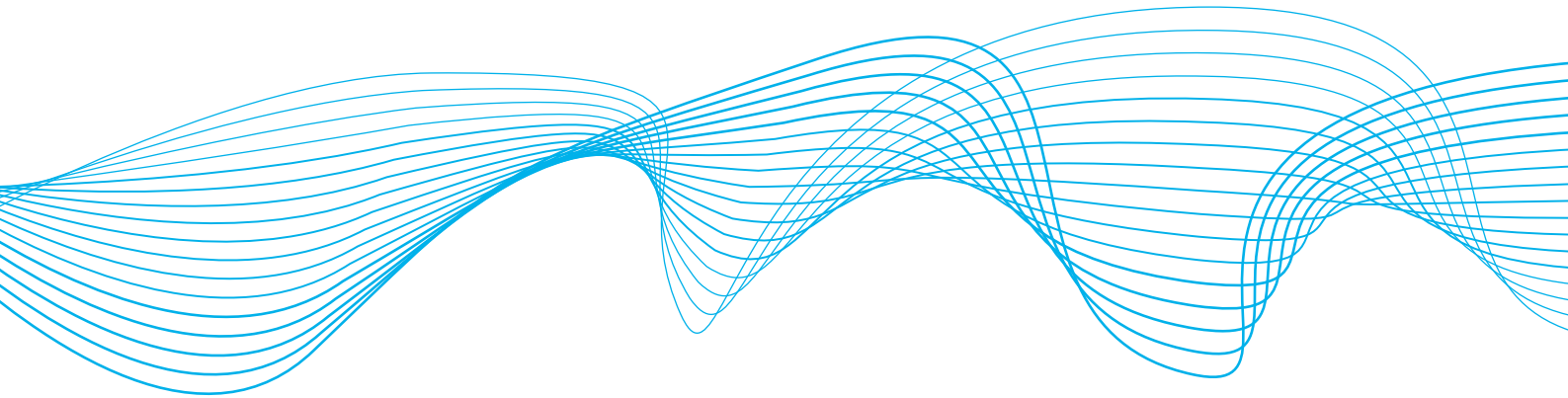# Reports of the Advisory Scientific Committee

No 10 / February 2020

The global dimensions of macroprudential policy

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Contents

Executive summary

This report elucidates the risk channels for EU economies associated with international financial integration and provides an overview of the macroprudential policy options that are available to address these risks.[1] It builds on the main insights from the rich academic literature developed recently to create a narrative of the role of global variables for the conduct of macroprudential policy at a national level. The report reviews the evidence on the cross-border spillovers of domestic macroprudential policies (MPPs). It also highlights key policy areas for making macroprudential policy as effective as possible. Annex 1 presents findings from several new research papers across the European System of Central Banks.

Global financial integration has increased substantially over the past three decades. This has made global variables more important for domestic economic and financial conditions. For example, global financial intermediaries may contribute to the build-up of systemic risk within domestic financial systems. Large and volatile capital flows may be associated with excessive foreign borrowing, credit booms and sometimes busts. EU economies are not an exception, with domestic financial conditions having strong interconnections with the rest of the world.

Recent research has established that there is a global financial cycle in capital flows, asset prices and credit that influences domestic financial cycles. Domestic economies are increasingly vulnerable to external shocks: changes in global risk aversion or financing conditions in the core economies (the United States but also China, Japan, the United Kingdom and the euro area) or their monetary policies. Domestic policymakers may be limited in their ability to influence domestic financial conditions independently from global forces.

EU economies have a dual role in the global financial landscape. They are part of one of the core global economies, and they are also individually affected by global developments. Moreover, the common monetary policy across the euro area is a distinctive feature for EU economies, with the potential to generate significant capital flows that may affect asset prices as well as funding and borrowing costs, both in the EU and globally. Although there is substantial financial integration within the euro area, its increasing depth was reversed somewhat by the financial crisis, notably including a decline in cross-border bank flows.

Global banks can be seen as generators, transmitters and receivers of global systemic risk through their cross-border activities. First, the management of their liquidity through internal capital markets may contribute to the cross-border transmission of liquidity shocks if, for example, banks withdraw funds from foreign markets in times of stress ("flight home" effect). On the other hand, the global liquidity management by banks can also have a stabilising effect on bank operations, since intragroup funding is often a substitute for volatile interbank funding. A second systemic risk dimension of banks' cross-border activities arises from the interactions between global conditions and both global and domestic banks' leverage and risk-taking (i.e. lending standards, funding and borrowing costs, and credit spreads). Monetary policy in the core economies, in particular the United States, has a substantial impact on the risk-taking behaviour of all banks in the global

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[1] The Advisory Scientific Committee worked on this report in 2018 and 2019, with 18 December 2019 as cut-off date for its content. Consequently, all references to the European Union include the United Kingdom, as do all data aggregates, as that country was a member of the European Union on that date.

financial system. US policy rates influence global banks' risk perceptions and portfolio allocation across the global spectrum of risky assets, with implications for the EU as well.[2]

The size, activities and interconnections of non-bank financial institutions are increasingly influencing the dynamics of the global financial system. Non-bank financial intermediaries are particularly active in wholesale funding markets. The funding risk associated with global banks tapping wholesale markets materialises when global liquidity conditions deteriorate, which may lead to "wholesale runs" and dollar shortages outside the United States.

A main objective of the regulatory reform following the global financial crisis was to make global financial institutions absorb the externalities they create with their global activities. This report focuses on the macroprudential policy implications of those activities and considers possible policy changes. For example, minor refinements to the current policy framework for banks might touch upon the weight of the cross-border variables in the identification methodology for global systemically important institutions (G-SIIs) and other systemically important institutions (O-SIIs) and requiring liquidity prudential ratios by significant currency. Global non-bank financial intermediaries need to be more closely monitored by macroprudential authorities, starting with access to granular information, while considering the variety of business models in this sector. Macroprudential authorities would then collectively be able to assess how non-bank financial institutions can contribute to the build-up of systemic risk. The natural next step would then be to develop a macroprudential toolkit for non-bank financial institutions, taking into account the variety of business models and institutions within this sector.

From a global perspective, each EU economy may be considered an open economy, although the EU as a whole needs to be aware of the global impact of the national policy decisions of its members. The institutional design in the EU means that domestic macroprudential policy is conducted at national level.

Empirical evidence shows that macroprudential policy can protect domestic financial systems from shocks originating at the global level and enhance resilience to such shocks. In the global setting, the following considerations are important for the conduct of domestic macroprudential policy:

- The need to address cross-border spillovers and leakages of domestic macroprudential measures provides a rationale for stronger cross-border coordination of macroprudential policies (including reciprocation of measures), also at a regional level.[3]

- The importance of core non-EU economies in the global financial cycle warrants close monitoring by EU macroprudential authorities. Structural shifts and cyclical developments in these core economies, particularly the United States and China, may be transmitted to EU countries, affecting their domestic financial conditions. This monitoring takes on greater

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[2] Another channel focuses on the activities of regional banks, which often borrow from global banks and use the funds to lend to domestic banks and domestic non-financial corporate borrowers in US dollars. This introduces a link between exchange rates and balance sheets. However, since the share of cross-border liabilities denominated in US dollars of EU banks is relatively small (16% of GDP and about one-quarter of total cross-border liabilities at the end of 2018), this channel may be of lesser importance for the EU.

[3] Macroprudential policies implemented in the domestic banking system may create inward spillovers (leakages) if domestic banking activities migrate to foreign banks or to non-banks that are not subject to the measure. Domestic macroprudential measures can trigger outward spillovers if the domestic measures induce externalities on foreign countries, e.g. through adjustments in the lending behaviour of domestic banks towards foreign borrowers.

importance in the light of the powers granted by European legislators to define countercyclical capital buffer rates for exposures to third countries.

- The amended OECD Code of Liberalisation of Capital Movements and the IMF Institutional View allow capital flow management measures to be used to achieve financial stability objectives under certain circumstances.

- While macroprudential policy and monetary policy are conducted separately, it is important to consider possible interactions between them and to reflect on the potential need for coordination between policy domains.

1 Introduction

Interest in macroprudential policy is growing around the world. The global financial crisis revealed significant flaws in the architecture of the global financial system, including the lack of a clear mandate to use macroprudential policy to address systemic risk. The ensuing regulatory reform has aimed to strengthen the role of macroprudential policy by developing a new set of tools (like the countercyclical capital buffer) and institutions (at both national and cross-national levels). This has led to a substantial increase in the use of macroprudential instruments compared with the years before the global financial crisis (International Monetary Fund, Financial Stability Board and Bank of International Settlements (2016) and Alam et al. (2019)).

Meanwhile, global financial integration has continued and presents new policy challenges to macroprudential authorities in open economies. While the global financial crisis has slowed the process of global financial integration (Chart 1), the degree of interconnection is far greater than 30 years ago. This may bring benefits, such as efficiency gains in the allocation of capital and better risk sharing, which may result in welfare gains.[4] Nevertheless, the rise in financial integration may also have exposed domestic economies to contagion from other economies, and large international capital flows can contribute to the build-up of systemic risk within the financial system. Addressing these vulnerabilities stemming from financial globalisation leads to new policy challenges for national macroprudential authorities in open economies.

Chart 1
Global gross capital inflows

(USD trillions)
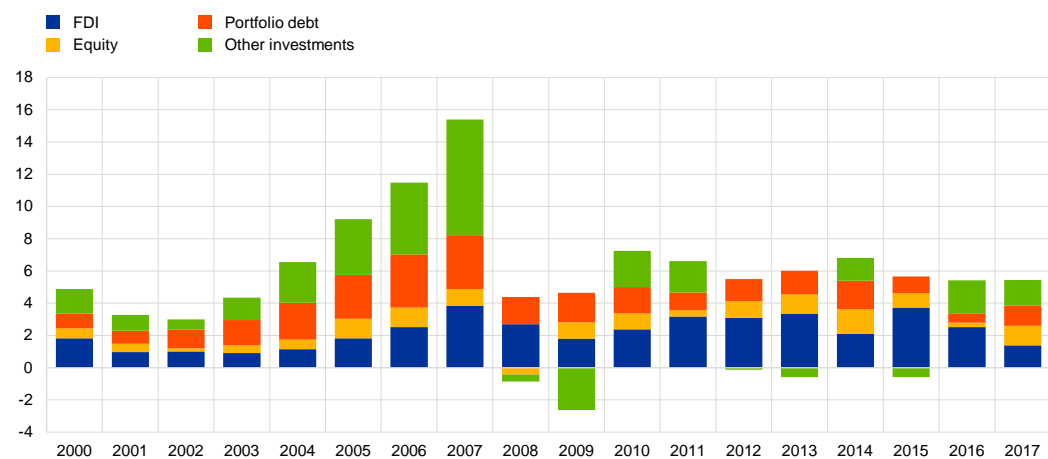
Source: IMF International Financial Statistics.
Note: The category of "Other investments" comprises mainly banking flows.

Earlier financial crises started with stress in some specific segment of the global financial market which spread quickly to become systemic. The Asian crisis in 1997-98 began in Thailand, Indonesia and Korea before spreading throughout Asia and having some global impact

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4   See e.g. Jeanne et al. (2012) for a review of the empirical evidence on the welfare gains of capital account liberalisation.

as well. Crises in Russia (1998), Brazil (2000) and Argentina (2001) followed, but with limited contagion to previously unaffected asset classes and countries. The global financial crisis was partly triggered by a relatively small market segment (US subprime mortgages represented less than 5% of the total originated mortgages at the end of 2007). It spread throughout the global economy when Lehman Brothers failed.

Evidence suggests that strong credit booms and large foreign financial flows are both key ex ante correlates of financial crises (Jordà et al. (2011), Gourinchas and Obstfeld (2012) and Caballero (2016)), although many "capital flow bonanzas" do not end in crisis. The usual transmission channel is through foreign financing of large local credit booms, often going through short-term debt, which is usually allocated to the least productive activities (such as real estate). Foreign funding would then evaporate in downturns – either suddenly, as is typically the case in emerging economies, or through slow runs, as in the euro area sovereign debt crisis. Beyond direct exposures, it is also important to look at indirect contagion channels (Clerc et al. (2016)).

This is particularly important for the EU, as it forms a major part of the global financial system with multiple layers of interconnections while maintaining macroprudential policy at the domestic level. Global liquidity conditions and monetary policy in core economies, such as the United States, the euro area and other EU economies, can be seen as the main drivers of the global credit cycle, influencing local credit dynamics and the risk-taking appetite of large financial institutions. At the same time, macroprudential policies in the EU are implemented at the national level. This implies that in their assessment of the macroprudential stance, EU macroprudential authorities must consider interconnections between their economies and other EU economies and, at a second level, the largest global financial centres. Furthermore, the range of tools available to EU macroprudential authorities is more restricted than in other jurisdictions, since capital flow management measures are typically not possible under current EU legislation (though they were applied during the Cypriot and Greek crises), and FX-related instruments are not available in the euro area for euro-denominated positions.

There has been a significant decrease in capital inflows to the EU following the global financial crisis, mostly explained by substantial cross-border retrenchment by EU banks. Considering the development of gross capital inflows to the EU, it can be observed that the category "other investments", which comprises mainly banking flows, has fallen substantially since the global financial crisis, signalling a retrenchment of cross-border activities by EU banks (Chart 2). Outflows have fallen sharply as well, with banks in the euro area showing a marked decrease in their cross-border claims after their peak just before the global financial crisis (Chart 3).

Chart 2
Gross capital flows to EU countries

(USD trillions)
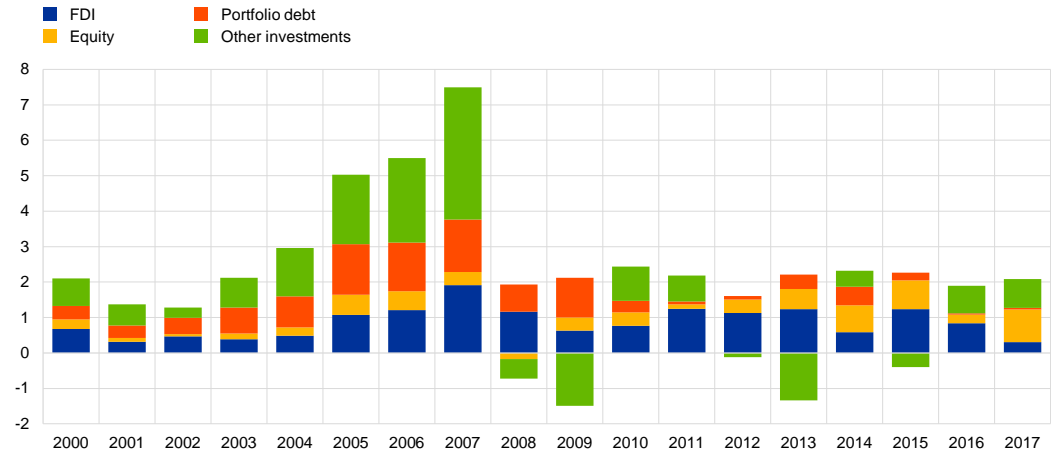
- ■ FDI
- ■ Equity
- ■ Portfolio debt
- ■ Other investments

Source: IMF International Financial Statistics.
Note: The category of "Other investments" comprises mainly banking flows.

Chart 3
Cross-border banking claims

(USD trillions)

- ■ Euro area
- ■ United States
- ■ United Kingdom
- ■ Developing countries
- ■ Offshore centres
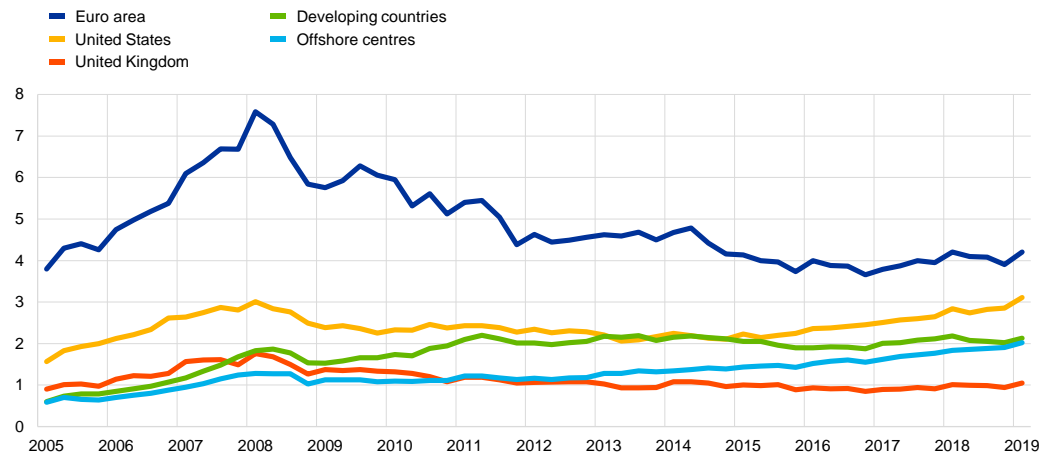
Sources: BIS International Banking Statistics and ESRB Secretariat calculations.
Note: Total cross-border claims (stock variable) by domestic banks, on an ultimate risk basis.

This report seeks to improve the understanding of the risk channels related to international financial integration for EU economies and of the macroprudential policy options available to mitigate these risks.[5] First, Section 2 discusses the existence of a global financial cycle, which

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[5] While a risk dimension relating to the cross-border risk channels within the EU economy may also exist, e.g. through the international transmission of the bank-sovereign nexus (Breckenfelder and Schwaab (2018)), the aim of this report is to provide a truly global perspective on risks and policies.

interacts with the domestic financial cycle, focusing mainly on the EU economies. Policymakers need to acknowledge the influence exercised by the global financial cycle on the domestic economy when conducting national macroprudential policy. In the case of the EU economies, the direction may run both ways, as the EU as a whole may also be considered a core global economy. Section 3 looks at the role of financial institutions in the global financial landscape, paying particular attention to the cross-border activities of global banks, the emerging role of non-bank financial institutions and the new developments observed since the global financial crisis. Some of these institutions are European and fall under the policy remit of European policymakers. Section 4 examines the consequences of these risk channels for macroprudential policy authorities, focusing on (i) the effectiveness of macroprudential policies, (ii) cross-border spillovers and international policy coordination, and (iii) the use of capital flow management measures for financial stability purposes. Section 5 concludes.

2 Interactions between domestic and global financial cycles

The domestic financial cycle is driven, at least in part, by global forces over which national authorities have little control. Domestic macroprudential authorities are expected to address cyclical macroprudential risks in their economies. But large parts of domestic cyclical developments are driven by the global financial cycle, which, in turn, is determined by factors outside the reach of macroprudential authorities.[6] This section therefore starts with a summary of the findings in the academic literature regarding the global financial cycle and continues with important considerations regarding (i) the particular nature of the EU, and (ii) expected developments in the near future.

2.1 Findings from recent research

Several studies find that financial cycles have become recently more global in nature. Rey (2015), Passari and Rey (2015) and Miranda-Agrippino and Rey (2019) have shown that global factors are behind a significant share of movements in a large cross-section of cross-border capital flows, asset prices and credit growth. Jordà et al. (2019) provide a historical perspective on national financial cycles over the past 150 years. They demonstrate that the degree of co-movement in credit, house prices and equity prices across 17 advanced economies reached unprecedented levels in the past three decades. The global financial cycle can be characterised by a high degree of co-movement in credit, house prices, returns on corporate bonds and equity prices worldwide. These are driven by observable global determinants, evident in capital flows and associated with booms and busts in asset prices and crises.[7] The existence of this global financial cycle means that economies cannot insulate their financial conditions from those of the rest of the world.[8] Di Giovanni et al. (2018) show in detail how the global financial cycle affects domestic financial conditions through domestic banks' external liabilities and funding costs, which pass through to borrowing costs for firms and households.[9] This means that economies are more vulnerable to outside shocks and are influenced by financing conditions in the financial centres, mainly the United States but also the euro area, the United Kingdom, Japan and, more recently, China. Financing conditions in financial centres are "setting the tone" in global financial markets (Rey (2015)). In these circumstances and in addition to funding obtained directly in international capital markets, domestic monetary policy cannot alter the impact on credit spreads of capital flows related to the global financial cycle, even for borrowing between domestic non-financial corporations and domestic banks, (Kalemli-Ozcan (2019)). Fendoglu et al. (2019) show that global liquidity limits the

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[6] For example, Cross and Poon (2019) document that international shocks from Australia's five largest trading partners (China, Japan, the EU, the United States and South Korea) have caused around half of all Australian business cycle fluctuations over the past two decades.

[7] A shorter definition of the global financial cycle could be the co-movement in credit flows and real and financial asset prices and returns worldwide.

[8] Baskaya et al. (2017) demonstrate the importance of domestic banks' external borrowing for the local credit supply in Turkey. Combining aggregate data on capital inflows with micro-data at the bank level and loan level, they show that larger, better capitalised banks with higher non-core liabilities increase credit supply when capital inflows are higher. This relationship is driven by domestic banks rather than foreign banks.

[9] Controlling for demand for credit, funding and borrowing costs that move with VIX are a more powerful mechanism than the effect of exchange rate fluctuations on balance sheets (a demand-side mechanism in opposition to supply-side mechanisms).

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effectiveness of local monetary policy on credit markets through a carry trade in international markets following a tightening of domestic monetary policy.

If flexible exchange rates cannot insulate the domestic economy from the global financial cycle, then the "trilemma" of monetary policy might be reduced to a "dilemma". With a global financial cycle at work, policymakers are left with two options: either (i) keep the capital account closed, thereby maintaining control of domestic conditions, or (ii) open the capital account, but lose some control of domestic conditions. But Kalemli-Ozcan (2019) argues that under shocks to risk premia, flexible exchange rates combined with macroprudential policy might be a better option, as flexible exchange rates can absorb risk shocks.

In parallel to the focus on the synchronisation of capital flows across countries, some studies investigate the co-movement of financial conditions across countries. For example, Habib and Venditti (2018) measure the time-varying correlations between indexes of financial conditions for the euro area and the United States. They report a mildly positive correlation (0.33) before the global financial crisis and a growing correlation during the financial and sovereign debt crises (0.71 between 2007 and 2012). After July 2012, the correlation turns negative, suggesting a decoupling of financial conditions between Europe and the United States. Schüler et al. (2019) analyse in detail the international synchronisation of financial cycles in G7 countries and find that a subset of them exhibit strong synchronisation in financial cycles, suggesting a need to carefully consider the future outlook for spillovers and common drivers (see Annex 1 for further details).

While research on the characteristics and determinants of the global financial cycle is still developing, current evidence signals the existence of a global factor that would explain much of the global financial cycle. This global factor could be seen as an indicator of global risk aversion and is highly correlated with the implied volatility index VIX (Rey (2015) and Bruno and Shin (2015a)).[10] Other factors driving the global financial cycle are monetary policy in advanced economies (Rey (2015), Bruno and Shin (2015b) and Miranda-Agrippino and Rey (2019)) and, given its role as the main currency in international markets, the US dollar.[11] Habib and Venditti (2019) build a measure of global risk based on the co-movement of stock market returns in 63 economies, which displays a strong negative correlation with global capital flows. Financial shocks seem to matter slightly more than US monetary policy shocks in driving global risk (see Annex 1 for further details).

Cross-border flows and foreign investors have important financial stability repercussions in domestic real estate markets, as they amplify boom-bust cycles. Empirical evidence suggests that capital inflows have a high predictive power for price booms in real estate markets (Aizenman and Jinjarak (2009, 2014) and Ferrero (2015)). More recently, the increased activity of foreign investors in real estate markets as a result of international financial integration has led to growing house price synchronisation in major global cities (International Monetary Fund (2018a)),

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[10] See also Milesi-Ferretti and Tille (2011) and Forbes and Warnock (2012).

[11] Preliminary results applying the novel framework of "capital-flows-at-risk" suggest that there are three main factors that have predictive power for medium-term portfolio debt flows to emerging economies: investors' risk appetite, US long-term interest rates and the US dollar (International Monetary Fund (2018c), Carney (2019)). See also Kalemli-Ozcan (2019) and Obstfeld (2019). Rather than considering the USD exchange rate as a pure driver of the global financial cycle, it can also be argued that it is an outcome of the cycle, which would thus be reflected in a two-way relationship between the global financial cycle and the USD exchange rate. Monetary policy of core economies, on the other hand, can be regarded as an exogenous driver of the global financial cycle.

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suggesting that there is a global cycle in real estate markets. Global financial conditions, such as accommodative monetary policy in core economies (United States, euro area, Japan, China and United Kingdom), contribute to the trend for rising synchronisation in global real estate markets. The synchronisation of cycles creates the potential for cross-border spillovers in real estate markets, as an economic shock in one part of the world is more likely to affect housing markets elsewhere. In addition, the volatility of real estate prices may increase since foreign investors tend to remove their funds from real estate markets more quickly than domestic investors do if yield expectations become more favourable abroad or if market uncertainty rises. Sharp declines in real estate markets and increased volatility could then feed through to domestic financial markets and the real economy (International Monetary Fund (2019)).

To provide some empirical evidence on the importance of the global financial cycle for EU economies, Table 1 depicts a heat map of correlation coefficients for gross capital flows[12] to visualise the degree of synchronisation both within the EU and with the rest of the world.[13] In general, capital inflows to EU countries show a positive correlation with capital inflows to other countries, as indicated by the red shading that dominates the heat map. Yet the co-movement of capital flows for EU countries is largely heterogeneous across regions and types of flow. Average correlations of gross capital flows are strongest for "other flows", i.e. banking sector flows, and weakest for portfolio equity. The correlation structure across geographical regions shows that synchronisation among EU countries in western Europe and central and eastern Europe is relatively strong on average. Moreover, the correlation of EU countries with the United States is the most pronounced, in particular for other flows and portfolio debt. In terms of magnitude, the correlation coefficient for other flows between EU countries and the United States ranges from -0.28 (Greece) to 0.68 (United Kingdom), with an average value of 0.18 across all EU countries. For portfolio debt, the EU-US correlation coefficients generally display higher values in western European economies (average value of 0.22) than in central-eastern Europe (average value of 0.07). The heterogeneous correlation structure across both countries and different types of EU capital inflows highlights the importance of distinguishing between different categories of capital flow, as emphasised by Avdjiev et al. (2018).

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[12]   Consistent with the bulk of more recent empirical literature on cross-border capital flows, we focus here on gross flows to take into account the fact that, particularly in advanced economies, the expansion of gross international asset and liability positions closely mirror each other, impairing the usefulness of net measures of capital flows. This is highlighted, among others, by Obstfeld (2012, p. 476) who argues that "it is certainly correct that gross asset and foreign and liability positions offer the best picture of potential stability risks, and that hazardous gross positions can build up even in the absence of any net international capital flows." Similarly, Borio and Disyatat (2011) argue that "[…] the popular "excess saving" view […] fails to distinguish sufficiently clearly between saving, a national account concept, and financing, a cash-flow concept, thereby focusing too heavily on net rather than gross capital flows."

[13]   All EU countries except Luxembourg (as not enough data on capital flows is available) are included in the dataset and allocated to Western Europe or Central/Eastern Europe accordingly. Other European countries in the dataset are Serbia (Central/Eastern Europe), Iceland, Norway and Switzerland (all of them allocated to Western Europe). The dataset comprises the following non-European countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Peru and Uruguay (Latin America); Australia, China, India, Indonesia, Israel, Japan, Malaysia, New Zealand, Pakistan, Philippines, South Africa, South Korea, Thailand and Turkey (Asia-Africa-Oceania); and the United States.

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Table 1
Correlation of gross capital flows to the EU and capital flows to other regions
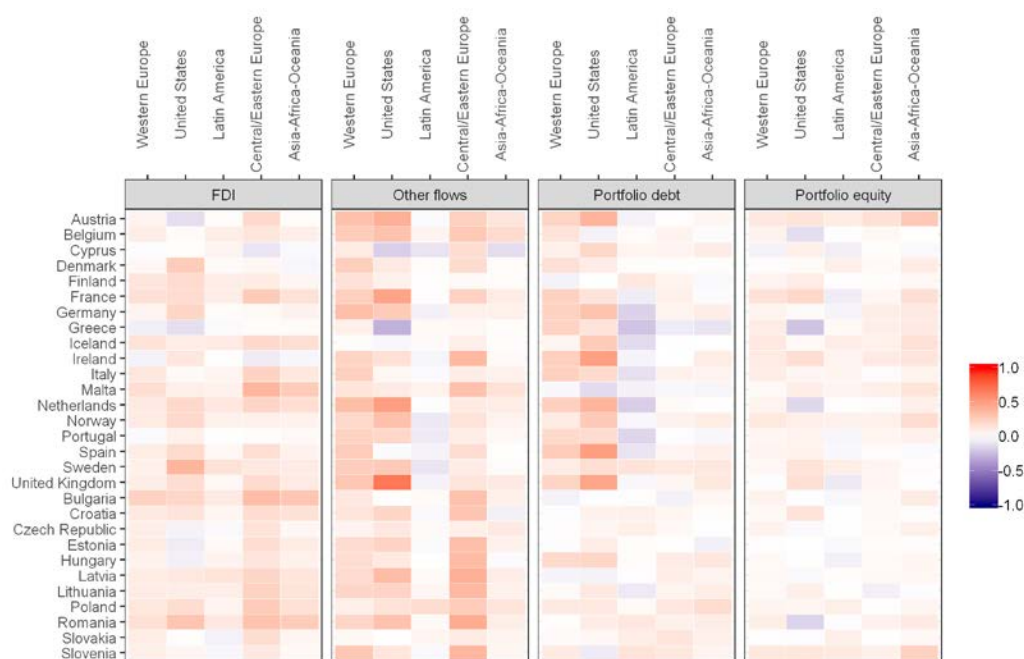
Source: ESRB calculations based on data from the IMF International Financial Statistics.
Notes: The data period is Q1 1990-Q3 2018 and the sample comprises 58 countries. Capital flows are normalised by GDP. For each country, the table shows the average of pairwise correlation coefficients by geographical region and type of capital flow. The colour level indicates the sign and intensity of correlation (red: positive; blue: negative; white: zero).

Chart 4 shows the impact of a global risk shock on credit growth, property price growth and total gross capital inflows in EU economies (blue bars) over the period 1990-2018. By way of comparison, Chart 4 also shows the impact of such a shock on a broader set of economies included in the sample (yellow bars). The reported values are derived from a panel regression model that considers the measure of global risk, provided by Habib and Venditti (2019), as a lagged explanatory variable and one of the three domestic variables as dependent variable. The econometric specification also includes several control variables and country-fixed effects (see Annex 2 for a detailed discussion of the methodology and data). Similar to the approach devised by Miranda-Agrippino and Rey (2019), the measure of global risk is based on a latent global stock market factor extracted from a large panel of stock market returns (63 countries), thus providing an indicator of the global financial cycle. As observed, credit growth, property prices and gross capital inflows decline in response to a one standard deviation increase in global risk, although with different intensities. Year-on-year household credit growth declines by about 0.3% following the global risk shock, while gross capital inflows decline by roughly 1.3% of GDP. The response of property prices, by contrast, is rather limited. Compared with all economies in the sample, EU capital flows respond more to global risk shocks, while the response of EU domestic household credit is comparable to the response in the rest of the world. Taken together, the evidence for EU countries suggests that heightened global risk leads to a decrease in credit growth, asset prices and capital inflows, which is consistent with the global financial cycle hypothesis.

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Chart 4
Impact of global risk shocks on domestic economic conditions

(percentages)
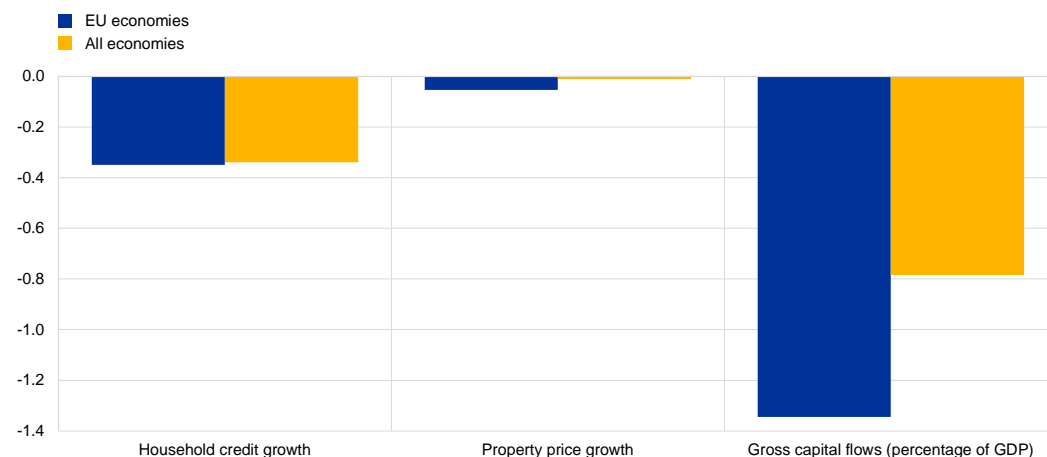
Notes: The chart shows the impact of a (one standard deviation) global risk shock on household credit growth, property price growth and total gross capital flows derived from a panel regression framework. The global risk indicator is taken from Habib and Venditti (2019), which is constructed from a global stock market factor similar to Miranda-Agrippino and Rey (2019). The data period is Q1 2000-Q3 2018. See Annex 2 for a detailed discussion of the methodology and data.

Complementary to the aggregated impact on the EU, it is also useful to look at the effects of the global financial cycle on individual EU economies. Figure 1 presents a geographical heat map illustrating how individual EU economies' gross capital inflows respond to the global financial cycle. The findings are based on country-level regressions of total gross capital inflows (as percentage of GDP) on the lagged global financial cycle indicator by Habib and Venditti (2019). While it can be observed that almost all EU economies are affected by the global financial cycle as indicated by the negative response coefficients, the exposure intensity varies considerably across countries, as shown by the different colour intensities. In general, the global financial cycle impact appears stronger for western European countries than for economies in eastern Europe. Particularly high exposure to the global financial cycle (dark blue) is visible for Ireland, the United Kingdom, Belgium, the Netherlands and Norway (not an EU Member State).

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Figure 1

Exposure of EU economies' capital flows to the global financial cycle

The evidence reviewed in this section suggests that capital flows, credit and asset prices across the globe have displayed positive co-movement in the past three decades, underscoring the existence of a global financial cycle which influences domestic financial conditions.[14] The empirical literature shows the existence of a close link between the global financial cycle and global risk sentiment and US monetary policy. Capital flows to EU economies display a largely positive correlation with capital flows in other regions, consistent with the concept of the global financial cycle. Moreover, an increase in global risk negatively affects EU credit growth, property price growth and capital flows, indicating that global shocks are transmitted to EU economies via domestic financial variables.

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[14] According to Potjagailo and Wolters (2019), the global financial cycle has intensified since the 1980s but has been present since the end of the 19th century.

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2.2 Characteristics and expected dynamics of global core economies

The global financial cycle implies that externalities are transmitted from the core economies to the rest of the world. Monetary and financial conditions in core economies (not restricted to the United States) have a global impact beyond the core economy itself. Policy actions in these core economies do not take account of the consequences they may have for the rest of the world. This is an asymmetric phenomenon, as actions in the rest of the world do not have an equivalent impact on the policy stance in core economies. At the same time, macroprudential authorities in open economies face the question of what actions they should take to protect their economies from developments in core economies.[15] In the following, we present further considerations related to the United States, the EU and China, and their interaction with the global financial cycle.

2.2.1 The United States as hegemon

Even after the collapse of the Bretton Woods system, the US dollar has maintained an essential role at the core of the international monetary and financial system. The Bretton Woods system established the US dollar as the global currency in place of the gold standard. This led to an increase in the global demand for US dollars as it became the global reserve asset. Although the Bretton Woods system collapsed in the 1970s, the US dollar continues to dominate global markets today. For example, more than 60% of the outstanding international debt securities and more than half of trade invoices are denominated in US dollars (Carney (2019) and European Central Bank (2019a)).

Its position as the main global currency for trade invoices and funding means that the US dollar transmits US monetary policy to the rest of the world (Obstfeld (2019)). US monetary policy affects real exchange rates, inflation and export competitiveness throughout the world. For example, a tightening of US monetary policy and the ensuing rise in the value of the US dollar would lead to an increase in domestic-currency import prices for countries invoicing their imports in US dollars (assuming that the volume of imports remains constant). Considering that exports are also invoiced in US dollars, the increased value of the US dollar would serve to raise exports of those goods against exports denominated in other (domestic) currencies. Ultimately, a stronger US dollar could thus prove contractionary for these economies (Obstfeld (2019)). Moreover, if the US dollar acts as the funding currency, a tightening of US monetary policy resulting in a rise in the value of the US dollar would impair the balance sheet positions of non-US borrowers with USD liabilities, triggering capital flow retrenchments across the globe (Bruno and Shin (2015b)).

The United States enjoys several advantages in its role as hegemon and issuer of US dollars: (i) US Treasuries viewed as safe assets subject to global demand (Caballero and Krishnamurthy (2009)), (ii) a higher return on external assets than on external liabilities (Gourinchas and Rey (2007)), and (iii) the possibility to run large trade and current account deficits. The United States obtains monopoly rents in the form of a positive endogenous safety premium on reserve assets (Farhi and Maggiori (2018)). However, the "exorbitant privilege" of the United States is

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[15]   Section 4 will consider the possible policy response to the global financial cycle in further detail.

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accompanied by an "exorbitant duty", as the United States provides insurance to the rest of the world in times of global stress through its safe assets (Gourinchas et al. (2017)).

The view that the hegemony of the US should be conducive to stability is under discussion. The traditional view is that global stability is more likely when there is a single dominant state (hegemon) than in alternative configurations (Webb and Krasner (1989)). Recently, however, a debate has arisen on whether the existence of a hegemon may also lead to instability and whether alternative configurations may be preferable in terms of welfare. In the analysis by Gourinchas et al. (2019), a decline in the relative weight of the United States in the world economy or destabilising US macroeconomic policies may shift the economy from a no-crisis position to a self-fulfilling crisis position. Similarly, Farhi and Maggiori (2018) state that crises may be more likely if the hegemon has an incentive to devalue its currency in order to stimulate its economy. Furthermore, in their model a multipolar world may increase the supply of safe assets and reduce the safety premium. In this regard, there are increasing calls for a multipolar international monetary and financial system with more than just the US dollar at the core (Eichengreen (2011), World Bank (2011), Gourinchas (2019) and Carney (2019)).

2.2.2   The duality in EU economies

EU economies have a special nature in relation to the global financial cycle: on the one hand, together they form one of the core global economies, but at the same time, they are individually affected by global developments. The EU as a whole can be seen as one of the core global economies, together with the United States, China and Japan. But the particular characteristics of the EU and the fact that EU Member States retain national powers in several key economic and financial policy areas, such as fiscal and macroprudential policies, imply that individual EU economies are separately subject to global developments. Thus, the interaction of EU economies with the rest of the world takes place symmetrically. Furthermore, while there is substantial evidence of the influence of US monetary policy on the global financial cycle, similar evidence for the euro area is more limited.[16]

Capital flows among EU economies (also considering the euro area separately) may exhibit material differences from capital flows to the rest of the world. The existence of a common monetary policy across the euro area is a distinctive feature of the capital flows within EU economies, as it can be seen as driving capital flows across the EU. Differences between ECB monetary policy rates and those of non-euro area economies may result in significant capital flows affecting asset prices in certain economies, particularly small, open economies outside the euro area. Focused on the latter, Potjagailo (2017) shows that euro area monetary policy generates sizeable (albeit dependent on individual country characteristics) spillovers on production and on financial variables in European countries outside the euro area. In the same vein, the results in Kucharčuková et al. (2016) and Hájek and Horváth (2016) suggest that spillovers of euro area

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[16]   The most recent literature focuses on the spillover effects of euro area unconventional monetary policy measures. Chen et al. (2017) find that cross-border spillovers of US unconventional monetary policy tend to be more sizeable and persistent than those generated by similar euro euro area measures. Similarly, Fratzscher et al. (2016) show that unconventional monetary policy measures in the euro area mainly affected global markets through a rise in confidence/decrease in risk aversion, while acknowledging that there is a bigger role for the Federal Reserve in driving global financial market developments and the global financial cycle.

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conventional monetary policy to non-euro area countries in the EU are significant and similar to the responses within the euro area economy.[17]

The development of cross-border banking flows within the euro area reveals their importance for those euro area economies that were more severely hit by the global financial crisis. Using the BIS Locational Banking Data, Chart 5 shows the development of banking flows from euro area economies to Spain, Greece, Italy, Ireland and Portugal. A significant, continuous increase can be observed in the years before the global financial crisis, followed by a significant decline. These flows were unprecedented in historical terms, based on debt instruments (rather than on equity) and particularly focused on countries with large and persistent current account deficits (Forster et al. (2011), Higgins and Klitgaard (2014) and Lane (2014)). Della Corte and Federico (2019) analyse two episodes of outflows from government debt securities in Italy (2011-2012 and 2018). They find important changes in the financial landscape and investor behaviour, which could explain why the 2018 episode did not become systemic (see Annex 1 for further details).

Chart 5

Cross-border claims in selected euro area economies

(left-hand scale: USD billions; right-hand scale: percentages)
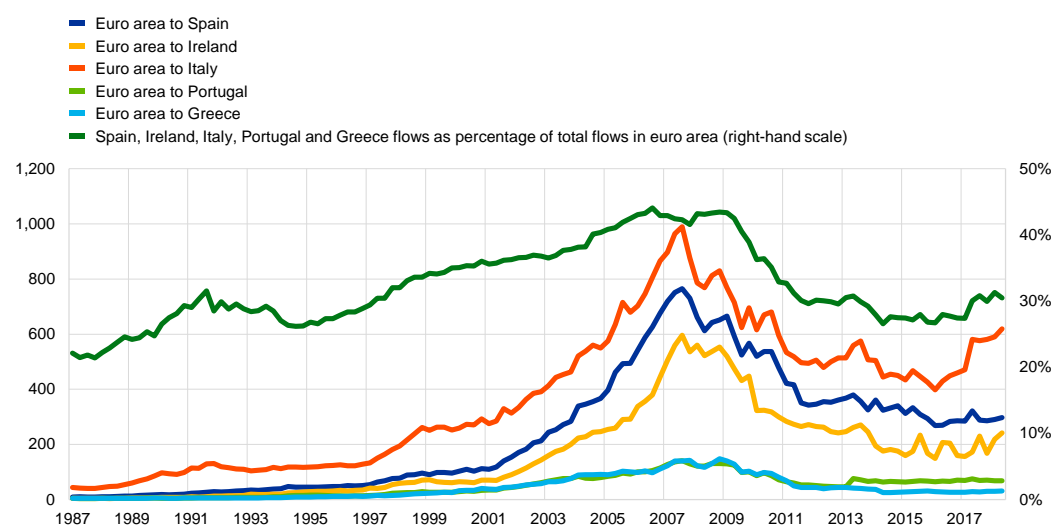
Sources: BIS Locational Banking Statistics and ESRB Secretariat calculations.
Note: The chart shows the cross-border claims from euro area countries reporting to the BIS Locational Banking Statistics (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands and Spain).

Within the EU, there seems to have been a slow-down in financial integration after the global financial crisis, seen also in banking activities. As observed in Chart 6, both the price-based and the quantity-based composite indicators of financial integration in the euro area peaked before the global financial crisis, decreased substantially until the end of 2012 and have somewhat

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[17] Considering individual EU countries not in the euro area, Maćkowiak (2006) finds that euro area interest rate shocks can account for a significant share of the external spillover effects to the Czech Republic, Poland and Hungary. Focusing on Slovakia before it joined the euro area, Horvath and Rusnak (2009) show that the impact of a euro area monetary policy shock on Slovak prices is more powerful than actions taken by Národná Banka Slovenska.

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recovered since then (although not to the levels reached before the global financial crisis). This trend is confirmed by the development of cross-border claims of EU banks on other EU countries (Chart 7), which have declined substantially since the global financial crisis (more than extra-EU claims).

Chart 6

Composite indicators of financial integration in the euro area
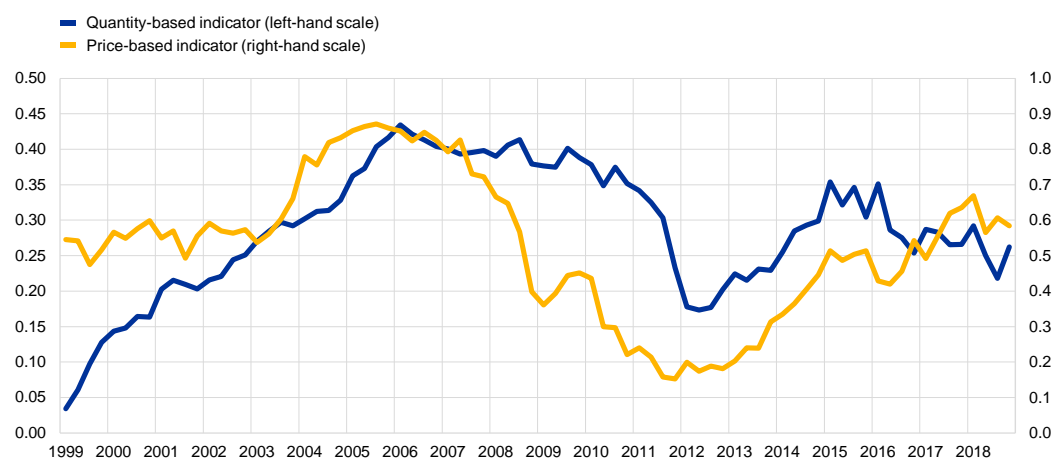
Source: ECB.
*Note: See **indicators of financial integration in the euro area** for further information on how the indicators are calculated.*

Chart 7

Cross-border claims of EU banks by destination country

(Q1 2008 = 100)
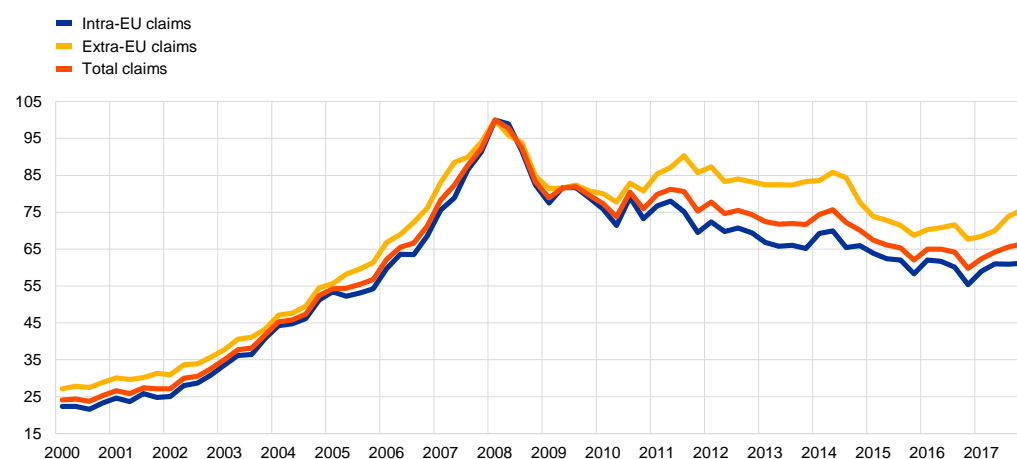
Source: BIS International Banking Statistics.
Note: Cross-border claims of banks based in all BIS reporting countries in the EU on other EU countries (intra-EU claims), non-EU countries (extra-EU claims) and all countries (total claims).

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2.2.3   The future role of China

Looking forward, the rising importance of emerging economies (and most notably China) in the global financial system is likely to lead to stronger international spillovers from monetary policy actions in these economies. To date, empirical evidence on the global impact of Chinese monetary policy on the global financial cycle is limited, mainly due to the lack of adequate data on the Chinese financial system. As shown in Chart 8, however, the increasing importance of China on the world stage suggests that the dynamics of the Chinese economy would also be a material contributor to the global financial cycle. Indeed, in the context of the global financial crisis, it has been argued that China's savings surplus helped the United States to borrow cheaply from abroad in the run-up to the crisis (Bernanke (2005) and Belke and Gros (2010)). Moreover, policies pursued by the People's Bank of China to build-up massive foreign reserves (and then running them down in 2015-2016) as part of its goal of maintaining currency stability have been identified as an important factor influencing global liquidity conditions. More recently, Ahmed et al. (2019) identify asset price movements and changes in global risk sentiment as the main channels through which financial stress in China would affect the US economy.

Chart 8

Cross-border banking claims on selected countries

(USD billions)
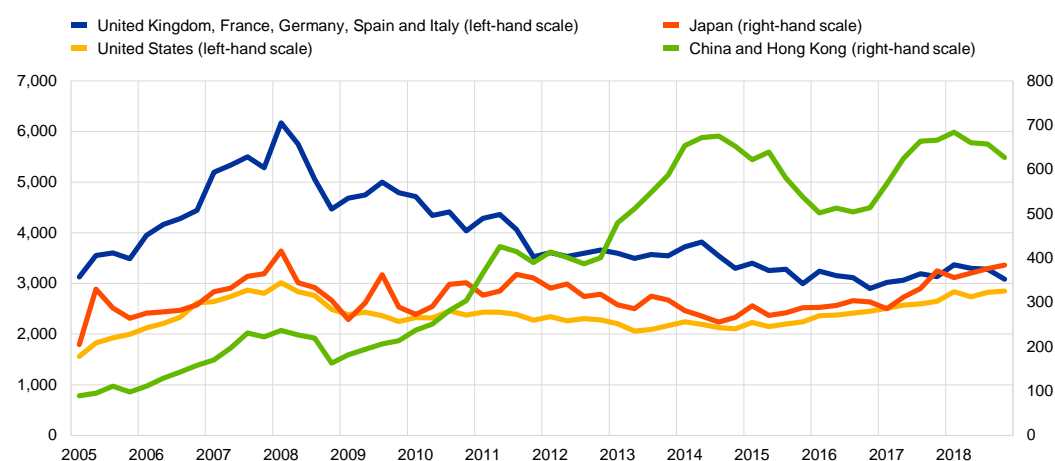
Source: BIS International Banking Data Statistics.
Notes: Cross-border claims for all maturities, instruments, currencies and counterparty sectors, aggregated for all BIS reporting countries, on an ultimate risk basis.

In the future, the impact of China's monetary policy stance on EU economies will crucially depend on the extent to which the People's Bank of China accumulates holdings of euro and other EU currencies in its reserves. China does not release official figures on the currency breakdown of its reserves, which IMF data showed totalling roughly $3.2 trillion in March 2019,[18] although estimates suggest that about one-fifth of the reserves are held in euro and about two-thirds in US dollars. Any future policy change in China that results in a larger accumulation of euro

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[18]   IMF data on International Reserves and Foreign Currency Liquidity (IRFCL).

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reserves, for example if China decides to reduce the share of USD reserves in favour of euro, will therefore imply potential spillovers for euro area economies.

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3 Financial institutions as generators, transmitters and receivers of global systemic risk

Despite the slowdown in capital flows after the global financial crisis, financial institutions still play a central role in the transmission of the global financial cycle to domestic economies. The purpose of this section is to discuss transmission channels of global risk, focusing on the cross-border activities of global banks and the increasing role of the non-bank financial sector in the build-up of systemic risk. The section concludes with a reflection on the new trends affecting mainly EU banks observed in the aftermath of the global financial crisis and on the policies addressing externalities created by these globally active financial institutions.

3.1 Cross-border activities of banks and the global financial cycle

The existence of a global financial cycle has important systemic risk implications, arising primarily from the interactions between the global financial cycle, key global factors (global risk and monetary policy in core economies)[19] and the cross-border activities of banks. The global financial cycle shares a mutually reinforcing relationship with the cross-border activities of global banks, in particular through their liquidity management and their risk-taking attitudes. Indeed, the global financial cycle is influenced by and influences global risk and the US dollar, and global bank behaviour is a result of, but also determines, the global financial cycle.

Cetorelli and Goldberg (2012a, b) provide evidence that internationally active banks manage their liquidity on a global scale, thereby contributing to international shock transmission and contagion.[20] There is an internal capital market in which funds are actively transferred between parent banks and their affiliates across the world. When hit by an adverse funding shock in their home country, parent banks reallocate liquidity within the banking organisation according to an internal pecking order. To buffer shocks to the parent bank's balance sheet, funds from foreign affiliate locations considered important "funding markets" are repatriated to the head office. Other foreign locations viewed by the parent bank as important "investment markets" because they contribute relatively more to the revenue streams instead remain destinations for funding. Cetorelli and Goldberg (2012b) document how the existence of an internal capital market for global banks increases the international propagation of domestic liquidity shocks due to a substitution effect between internal and external lending. Banks with low levels of liquid assets on their balance sheet make active use of cross-border internal funding in response to local shocks, while increases in internal funding are associated with decreases in foreign lending. The results suggest that for each extra dollar of internal lending that a liquidity-constrained global bank receives from its foreign offices, foreign external lending declines by 29 cents.

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[19] The US dollar is related to the global financial cycle as well, although that relationship seems to be bidirectional, in contrast to the global risk sentiment and the monetary policy in core economies.

[20] See also Buch and Goldberg (2015) who discuss the results of a multi-country research initiative analysing the international transmission of liquidity shocks.

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Global sourcing activity by banks, while contributing to the international transmission of shocks, can also constitute a stabilising factor for banks' operations in times of financial stress, as intragroup funding may act as a substitute for volatile interbank funding. Reinhardt and Riddiough (2014) report that, when global risk increases, interbank funding is withdrawn from foreign economies, but cross-border intragroup funding increases as global banks aim to smooth liquidity shocks. The evidence provided by Pawłowska et al. (2015) for the Polish banking sector is consistent with these findings. Foreign affiliates with ex ante higher dependence on parent funding continued to receive more funding relative to other banks during the global financial crisis, allowing them to provide relatively more credit to domestic borrowers in Poland. This is in line with the evidence on the retrenchment of euro area banks discussed in Annex 1, which suggests that multinational and decentralised banks have reduced their international lending activity less since the global financial crisis. Moreover, Temesvary et al. (2018) find evidence that US monetary easing has an effect on lending to countries outside the United States, transmitted through increases in cross-border flows from US banks.

Related to the existence of an internal capital market for global banks, there is evidence for a "flight home" effect, as documented by Giannetti and Laeven (2012) during several crisis periods. Lenders active in the global syndicated loan market appear to reduce their foreign balance sheet positions to support domestic activities following a banking crisis in the bank's home country. The flight home effect is driven by banks' increased risk aversion and the higher probability of a bailout associated with domestic lending. Shim and Shin (2018) provide evidence for the flight home effect based on aggregate banking flow data, showing that financial stress in home countries of international banks is a major driver of banking outflows from emerging economies. This finding also holds for the period after the global financial crisis. Consistent with an extensive literature on the role of distance in international financial transactions (starting with Portes and Rey (2005)), De Haas and Van Horen (2013) identify geography as an important determinant for the intensity of the flight home effect. During the recent financial crisis, international banks cut lending more drastically to borrowers that were geographically distant, while lending to geographically closer borrowers remained more stable. The role of geography is also an important factor in the international investment patterns of equity investors. Della Corte (2019) shows that geography and trade ties are key predictors of bilateral investment flows and holdings (see Annex 1 for further details).

A second important systemic risk dimension associated with the cross-border activities of banks stems from the way in which global liquidity conditions affect banks' leverage and risk-taking through currency depreciation and appreciation. Earlier work by Krugman (1999) and Céspedes et al. (2004), which focused on emerging economies, shows how depreciation of the domestic currency can theoretically reduce domestic activity through home balance sheet effects. On the empirical side, Aguiar (2005) studies the impact of the Mexican peso crisis of 1994 on corporate investment and finds evidence confirming the role of weak balance sheets in driving the recessionary impact of devaluations in emerging markets. Also focused on South American economies, Kalemli-Ozcan et al. (2016) find that when currency crises co-occur with banking crises, domestically owned exporting corporates with unhedged foreign currency debt reduce investment while foreign-owned exporters increase investment despite their unhedged foreign currency debt. Among other contributions,[21] Bruno and Shin (2015b) construct a model showing

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[21]   See also Gabaix and Maggiori (2015) and Miranda-Agrippino and Rey (2019).

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that there is a "risk-taking channel" of currency appreciation. In their framework, global banks lend to regional banks, which in turn lend to corporate borrowers in US dollars. This introduces a link between exchange rates and financial stability: an appreciation of the local currency leads to local borrowers having stronger balance sheets, which decreases borrowers' credit risk and increases bank lending capacity and risk-taking by banks. In the converse exchange rate scenario, however, the model predicts that episodes of US dollar appreciation will be associated with deleveraging by global banks and an overall tightening of global financial conditions. In this way, the model illustrates how cross-border banking and fluctuations in the leverage of global banks transmit financial conditions globally, and it explains why financial crises are often linked to dollar shortages.[22] The main predictions of the model are confirmed empirically by a panel study of 46 countries, showing that an appreciation of the local currency against the US dollar leads to an acceleration in bank capital inflows. In addition, the findings document a close relationship between bank leverage and global risk aversion approximated by the VIX. Similarly, Kalemli-Ozcan et al. (2019) show that corporate leverage increases with local currency appreciations and decreases with depreciations, which tend to have larger effects.

The risk-taking channel of currency appreciation thus has important implications for financial stability in countries whose banking systems are heavily reliant on debt denominated in foreign currency. Chart 9 shows a breakdown by currency of cross-border liabilities across different geographical regions in 2018. For EU economies, the volume of cross-border liabilities denominated in US dollars is about 16% of GDP, compared to about 36% of GDP for cross-border liabilities denominated in euro. The pound sterling, the Swiss franc and the Japanese yen play only minor roles. In non-EU European economies, the euro is the dominant currency for cross-border bank debt, while debt denominated in US dollars and Swiss francs (mostly in Switzerland) represents a much smaller share of overall foreign bank debt. This may weaken financial stability concerns in non-EU European economies, as most of them have little or no exchange rate fluctuations against the euro due to institutional arrangements.[23] In Asia, Africa and Latin America, the US dollar plays the most important role for cross-border bank debt, suggesting greater concern over dollar shortages in the event of global financial conditions tightening. Even if banks themselves are hedged or are required by regulation not to have currency mismatches, sectors in the real economy (households and non-financial corporations) are typically not hedged or not subject to such regulatory requirements. Risks may be directly transferred to them.

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[22] In an empirical study on the determinants of financial crises in advanced and emerging economies over the period 1973-2010, Gourinchas and Obstfeld (2012) find that rapid increases in leverage and sharp real appreciations of the currency are the two most reliable predictors of financial crises.

[23] Bosnia-Herzegovina, for example, has a currency board with the euro. In Turkey, regulatory requirements ensure that there is no currency mismatch in the balance sheets of domestic banks (a requirement also used in other emerging economies).

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Chart 9
Currency composition of cross-border liabilities

- US dollar
- Euro
- Japanese yen
- Pound sterling
- Swiss franc
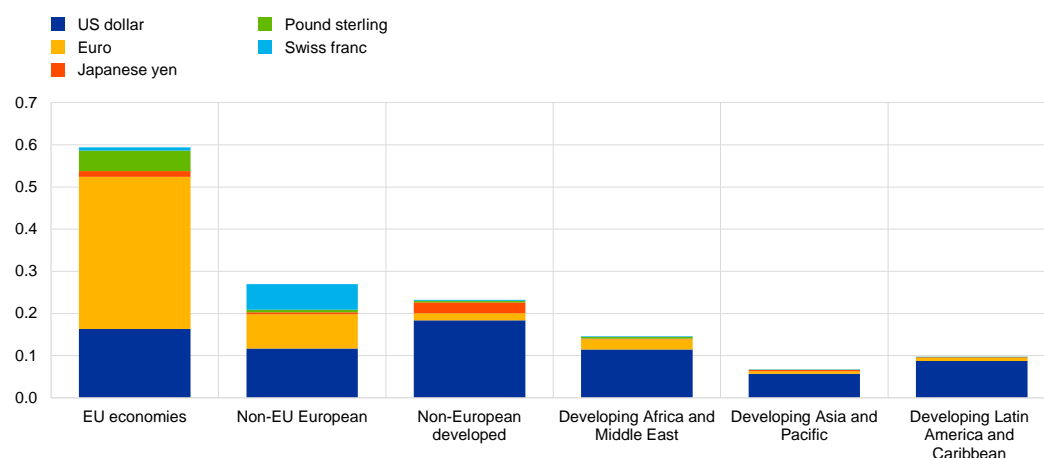
Source: BIS Locational Statistics.
Notes: The chart shows total cross-border claims of all BIS reporting countries on borrowers across different geographical regions as a share of GDP in the third quarter of 2018. Non-EU European comprises Albania, Belarus, Bosnia-Herzegovina, Iceland, Macedonia, Norway, Russia, Serbia, Switzerland, Turkey and Ukraine. Non-European Developed comprises Australia, Canada, Japan, New Zealand and the United States.

A link between the level of monetary policy rates and the risk-taking behaviour of banks and other financial intermediaries, termed "the risk-taking channel of monetary policy", has also been identified (Borio and Zhu (2012)) in addition to its impact on cross-border credit volumes, captured by capital flow aggregates (Rey (2015) and Correa et al. (2018)).[24] A loose monetary policy stance over an extended period of time may bias economic agents' perceptions of risks and risk tolerance, thus increasing the overall level of bank risk in the system.[25] The existence of a global financial cycle implies that the risk-taking channel of monetary policy is global as well (mostly exercised through lending standards and credit spreads).[26] Hence, time variation in US policy rates influences global banks' risk perceptions, and lower rates encourage them to search for yield across the global spectrum of risky assets. Kalemli-Ozcan (2019) provides evidence on such international risk spillovers linked to exogenous shocks to US monetary policy for several advanced and emerging market economies. The transmission differs across the two sets of countries due to the different sensitivities to the risk perception of global investors. Ioannidou et al. (2015) find that banks in Bolivia grant riskier loans with declining US interest rates, and banks do not adequately price the risk of increased loan default probabilities. Lee et al. (2019) study the international dimension of the risk-taking channel of monetary policy in the global market for syndicated loans. They provide evidence for global spillovers of monetary policy: lower US interest rates are associated with the origination of ex ante riskier loans to borrowers outside the United States.

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[24] Moreover, Correa et al. (2018) identify a cross-border bank portfolio channel that is driven by monetary policy in the source countries: a relatively tighter monetary policy stance in source countries erodes the net worth and collateral values of borrowers in recipient countries, prompting banks to reallocate their claims towards safer foreign counterparties.

[25] See also Jiménez et al. (2014), Altunbas et al. (2014), Dell'Ariccia et al. (2017), and Delis et al. (2017) for evidence on the risk-taking channel of monetary policy.

[26] There is a vast amount of theoretical research on monetary policy and its spillovers in open economies, starting with Obstfeld and Rogoff (1995) and continuing with Corsetti and Pesenti (2001), Galí and Monacelli (2005), Gabaix and Maggiori (2015) and many others.

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The evidence on the international dimension of monetary policy highlights the potential challenges faced by central banks when trying to influence bank lending in their own jurisdictions. More specifically, if a central bank in one country is loosening its monetary policy stance, this might inadvertently counteract the tighter stance of a central bank in another country by encouraging globally active lenders to extend credit to riskier borrowers in the other country. Macroprudential policies that complement monetary policy actions might therefore constitute effective tools to mitigate the unintended cross-border spillovers of monetary policy.

3.2 The emerging role of non-bank financial institutions

In addition to traditional banks, the activities of non-bank financial institutions influence the dynamics of the financial system and the global financial cycle. In their role as major financial intermediaries in the global financial system, non-bank financial institutions strongly interact with global banks, influencing their liquidity management, leverage and risk-taking behaviour. Their interactions with banks can serve to amplify systemic risks and spillovers, which can transmit across sectors and national borders. Beyond the links with banks, non-bank financial institutions may also be transmitters of the global financial cycle to domestic economies through their global activities.

On aggregate, non-bank financial institutions have stronger cross-border linkages than banks, on both the assets and the liabilities sides. Data from the Financial Stability Board (2019) for the euro area as a whole indicate that the exposures and liabilities of non-bank financial institutions to the rest of the world were about one-quarter of their total assets at the end of 2017 (28% and 24% respectively).[27] Among European jurisdictions, cross-border exposures of the non-bank financial sector were particularly elevated for Switzerland (65%), Ireland (39%) and Luxembourg (38%). On the liabilities side, non-bank financial institutions in Ireland and Luxembourg received around two-thirds of their funding from other countries. Looking at investment funds, Chart 10 shows how around half of the financial assets (debt instruments and equity shares) held by euro area investment funds are issued by non-euro area residents, emphasising that non-bank financial institutions have significant cross-border exposures.

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[27] For the population of banks assessed by the Basel Committee on Banking Supervision for the identification of G-SIIs, the proportion of total cross-jurisdictional exposures and liabilities to total assets averages 23% and 21% (the third quartile would be 35% and 30% respectively). These are typically the banks with more intense cross-border activity, as other smaller domestic lenders would show lower percentages.

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Chart 10

Debt securities (left panel) and shares (right panel) held by euro area investment funds

(percentages)

- Euro area-MFI
- Euro area-Gov
- Euro area-OFI
- Euro area-ICPF
- Euro area-NFC
- Euro area-non-residents

a) Debt securities

b) Shares
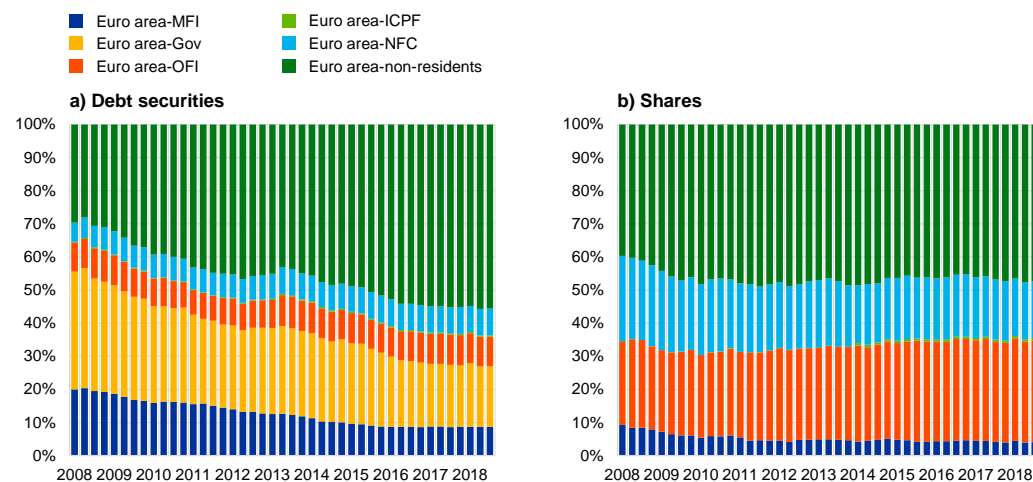
Source: ESRB Risk Dashboard, charts 1.8 and 1.9.

Bruno and Shin (2015b) illustrate the theoretical role of wholesale funding in the international banking system. In their model, global banks finance cross-border lending to regional banks by tapping USD money market funds in financial centres. In this way, wholesale funding in US dollars contributes to leverage/deleverage cycles of global banks through which financial conditions spread globally. Regarding European banks, Shin (2012) documents that European global banks had a major impact on US domestic credit conditions in the period leading up to the subprime crisis by drawing on wholesale funding in the United States and lending the funds back to US residents. The availability of wholesale funding gave European banks further room to extend credit, allowing them to increase leverage in a period of low perceived global risks.

The funding risks associated with global banks tapping wholesale markets may materialise when global liquidity conditions deteriorate, potentially resulting in episodes of "wholesale runs" and severe dollar shortages. A loss of confidence in money market funds and the large need for USD funding by European banks amplified market tensions during the Lehman bankruptcy (Baba et al. (2009) and McGuire and von Peter (2009)). The dollar shortage was alleviated only when central banks coordinated their policy response in providing US dollars to banks outside the United States through swap lines.[28] Hence, the maturity mismatch of EU financial intermediaries that is created by US dollar wholesale funding to finance longer-term activities and assets is a key vulnerability that should be addressed by micro- and macroprudential policymakers (European Systemic Risk Board (2011)).

The role of non-bank financial institutions also relates to the risk-taking channel of monetary policy. Lee et al. (2019) find that, in the global syndicated loan market, non-bank

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[28]   Pérignon et al. (2017) investigate wholesale funding shortages in the European market, focusing on certificates of deposit (CDs) that are issued by banks and bought largely by money market funds. While they do not find evidence for market-wide wholesale funding freezes during 2008-2014, they observe that many individual banks experienced funding shortages during this period.

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lenders originate riskier loans than banks to borrowers outside the United States in response to declines in the federal funds rate. Irani et al. (2018) show that non-bank lenders, both foreign and domestic, have increased their activity in the United States syndicated loan market since the early 2000s. The entry of non-bank lenders was partly driven by banks' efforts to circumvent the capital requirements associated with corporate loans, as weakly capitalised banks responded to a tightening of bank capital regulation by increasing loan sales to non-bank institutions. Similarly, non-banks have also entered the leveraged loan market, taking the riskier tranches of these products (Bank of England (2018), European Systemic Risk Board (2019a) and Financial Stability Board (2019)).

3.3   New trends after the global financial crisis

In the aftermath of the global financial crisis, low interest rates and unconventional monetary policy may have altered the spillovers of monetary policy in core economies.
Monetary policy since the global financial crisis has brought official interest rates to very low (even negative) levels, and central banks have used unconventional tools (such as quantitative easing) to achieve their objectives. In the case of the global core economies (the United States, the euro area, the United Kingdom, Japan and China), the transmission channels of such monetary policy decisions and the contribution of these decisions to the global financial cycle may have been affected.[29] Portes (2012) argues that simultaneous quantitative easing by the largest economies could achieve simultaneous expansion, which would have first-order effects on the natural rate of interest and would help to restore normal monetary conditions. But smaller economies, including emerging economies, could find that the coordinated actions by the larger economies generate excessive price increases in financial assets and real estate. Ammer et al. (2016) obtain similar results: spillovers from US monetary policy had a stabilising effect on the global economy after the global financial crisis, but when the economies are at very different points in the business cycle (as was the case for emerging economies in the aftermath of the global financial crisis), monetary policy spillovers may not be stabilising. Regarding unconventional monetary policy measures, Curcuru et al. (2018) estimate that the international spillovers of quantitative easing tend to be smaller than those from conventional monetary policies. Similarly, Chen et al. (2016) find larger effects of quantitative easing in the United States for emerging economies than for advanced economies. They argue that the size of these effects depends partly on how each economy reacts to US policy shocks.

A decrease in the cross-border activities of EU banks has been observed in the wake of the global financial crisis.[30] As seen in Chart 3 in the introduction, the global financial crisis generated a sharp decrease in the cross-border flows of banks, which, in the case of EU banks, has not been reversed. Indeed, while other global banks have already reached and surpassed the pre-crisis levels, cross-border flows of EU banks are currently at similar levels to 2006. In terms of cross-border claims across geographical areas (Figure 2), EU banks seem to have reduced their exposure towards the United States and emerging Europe, with weak increases in cross-border

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[29] De Santis and Zimic (2019) study the importance of foreign spillovers in the dynamics of the two-year risk free rate of the United States, the euro area, the United Kingdom and Japan, finding that the contributions of foreign shocks to those rates changed over the period 2007-2018.

[30] See also McCauley et al. (2017).

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flows to Asia-Pacific. Going into the structure of international banks in further detail, Argimón et al. (2019) find that banking systems characterised by a larger proportion of local claims (multinational systems) and banking systems that raise funds locally in the jurisdiction where they are located and lend there (decentralised systems) have reduced their international banking activities less (see Annex 1 for further details).[31]

Changes in bilateral cross-border claims

(USD billions)
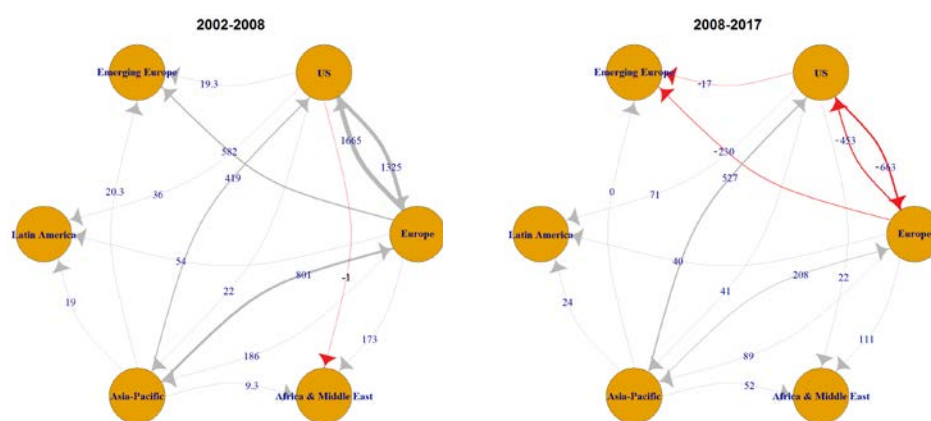
Source: BIS International Banking Statistics.
Notes: Changes in bilateral cross-border claims over the two periods (Q1 2002-Q2 2008 and Q1 2008-Q4 2017). Red arrows indicate negative gross flows.

The development of the non-bank financial sector worldwide is relevant for the EU, as its banks seem to be highly interconnected with non-bank financial institutions in third countries. Data from the Financial Stability Board (2019) show that the total assets of other financial intermediaries grew from $60 trillion in 2007 to almost $120 trillion in 2017, while total assets of banks amounted to $150 trillion in 2017. The growth of the non-bank financial sector around the world highlights its relevance in the transmission of the global financial cycle to domestic economies. In the case of the EU, some jurisdictions have particularly large non-bank financial sectors and EU banks in general are highly interconnected with non-banks located in third countries. Table 2 sets out the cross-border exposures of EU banks to different types of non-bank financial institutions, using granular bank-level data comprising 131 banks (see Abad et al. (2017) and European Systemic Risk Board (2017) for further details). The data highlight the high degree of global cross-border interconnectedness of EU banks with non-bank financial institutions. About 60% of EU banks' total exposures to non-financial institutions are to institutions domiciled outside the EU. In particular, the data reveal strong linkages between EU banks and institutions in the United States, most notably finance companies (8.2%) and securitisation vehicles (7.1%). EU banks also have substantial exposures to non-bank financial institutions in the Cayman Islands,

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[31] Similarly, De Haas and Van Lelyveld (2014) find that subsidiaries of multinational banking groups that relied more on wholesale funding reduced their lending more significantly than other peers.

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Turkey and Jersey.[32] Furthermore, García-Luna and Hardy (2019) find that banks are increasingly lending to non-bank financial institutions located in financial centres (those located in the United States, the Cayman Islands, the United Kingdom, Luxembourg, Ireland, Japan and the Netherlands account for 75% of this lending) and even turning to them for their funding in international currencies. According to their data, among non-bank financial institutions, those located in the Cayman Islands are the second largest funding source of US dollars and the third largest funding source of euro in the world.

Table 2

Cross-border exposures of EU banks to non-bank financial institutions by country of domicile and type of non-bank financial entity (weighted by exposure size)

(Q1 2015; percentages)

Country / type of shadow banking entity	1. UCITS MMF	2. Non-UCITS MMF	3. Non-MMF investment funds	4. Finance companies	5. Broker-dealers	6. Credit insurers/ financial guarantors	7. Securitisation	8. Non-equivalent banks/ insurers	9. Other	Total
DE	0	0	3.7	1	0	0	1.2	0	0.4	6.3
ES	0	0	0	0.3	0	0.1	0.3	0	0.1	0.7
FR	0.7	0	0.5	0.6	0	0	2.2	0	0.4	4.5
GB	0	0.4	2.5	2.0	0.4	0.5	2.2	0	2.4	10.5
IE	0	0	0.8	0.7	0	0	4.5	0	0.3	6.3
NL	0	0	0.2	0.6	0	0	1.5	0	0.1	2.5
LU	0.3	0	2.3	0.7	0.2	0	1.2	0	0.4	5.2
EU other	0.1	0	2.0	1.4	0	0	0.4	0.1	0.3	4.4
HK	0.1	0	0.5	0	0.6	0	0	0	0.1	1.3
JE	0	0	0.2	0.1	0	0	2.7	0	0	3.0
JP	0	0	0.2	0.1	0.6	0	0	0.4	0.2	1.5
KR	0	0	0	0.2	0	0	0	1.9	0.5	2.6
KY	0	0	3.4	0.7	0	0	1.8	0.1	0.5	6.5
RU	0	0	0	0.1	0	0	0	1.7	0.1	1.9
TR	0	0	0	0.4	0	0	0	3.0	0	3.5
US	0.7	0.2	4.0	8.2	0.3	0.3	7.1	1.6	4.7	27.1
RW other	0	0.1	1.9	1.2	0.6	0.6	0.8	4.4	2.5	12.1
Total	2.0	0.9	22.3	18.2	2.8	1.4	26.2	13.3	13.0	100.0

Sources: European Systemic Risk Board (2017) and Abad et al. (2017).
Notes: UCITS = undertakings for collective investment in transferable securities; MMF = money market fund; RW = rest of world. Data refer to individual exposures equal to or above 0.25% of eligible capital in the first quarter of 2015. Country abbreviations on the left-hand side refer to the country of domicile of the non-bank financial (shadow banking) entity. The numbers/headings at the top refer to the type of shadow banking entity. The table excludes investment firms and exposures greater than 25% of the institutions' eligible capital (the large exposure limit).

Moreover, cross-border investors from the non-bank financial sector are important intermediaries in real estate markets, particularly for commercial real estate. Evidence reported in European Systemic Risk Board (2018b) indicates that foreign investor activity in European markets of commercial real estate has increased in recent years (Chart 11). In 2017 more than half of the investor activity in Europe came from foreign sources. Moreover, the majority of foreign investor activity (60%) stemmed from non-European investors, mainly US and Asian investors. Furthermore, institutional investors such as Real Estate Investment Trusts (REITs) and private equity firms account for a large proportion of foreign investors. This makes it more likely that domestic real estate markets are affected by the risk sentiment of global investors.

[32] European banks' interconnectedness with non-bank financial institutions is also substantial on the liabilities side. According to data reported in European Systemic Risk Board (2018a), the overall amount of euro area banks' wholesale funding provided by European non-bank financial institutions totalled €2.2 trillion at the end of 2017.

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Chart 11

Commercial real estate transactions in Europe by investor origin

(left-hand scale: EUR billions; right-hand scale: percentages)

- Domestic investors (left-hand scale)
- Cross-border investors (left-hand scale)
- Cross-border share (right-hand scale)
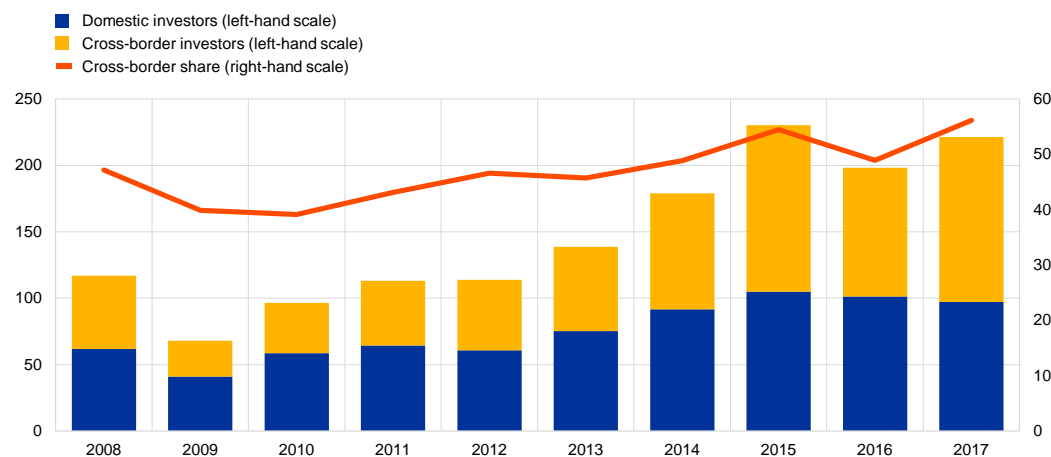
Sources: European Systemic Risk Board (2018b) and Real Capital Analytics.

3.4 Policies addressing globally active institutions

A first area of macroprudential policy refers to global banks in their role as transmitters of the global financial cycle to national economies, where further refinements of policies implemented after the global financial crisis may be possible.[33] The existence of unaddressed externalities is one of the rationales for macroprudential policy. Global banks create such externalities, since they do not take into account the social cost on domestic economies of their decisions. Buffers for global systemically important institutions (G-SII) and other systemically important institutions (O-SII) have been implemented in the aftermath of the global financial crisis and may be effective tools for addressing pro-cyclicality, externalities and moral hazard from these institutions.

Increasing the weight of the cross-border variables in the G-SII and O-SII identification methodology and buffer level calibration could adjust the cross-border risks posed by larger banks but could also be seen as promoting domestic activities. Currently, the "cross-jurisdictional activity" measured by the level of cross-jurisdictional claims and liabilities of each institution has a weight of 20% in the overall G-SII identification scheme (Basel Committee on Banking Supervision (2018)).[34] One possible way of adapting the existing buffers in the prudential framework, in order to internalise more directly the cross-border risks posed by global banks, could be to give more weight to the cross-border variables in the G-SII identification methodology (or, at least, to use a wider set of indicators under the relevant category).[35] But increasing the weight of

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[33] The International Association of Insurance Supervisors (IAIS) has recently adopted a "holistic framework" to systemic risk, which is expected to enter into force in 2020 (International Association of Insurance Supervisors (2019)).

[34] At the European level, Article 131 of Directive 2019/878 mandates the European Banking Authority and the European Systemic Risk Board (ESRB) to develop the methodology for the design and calibration of O SII buffer rates.

[35] Indeed, seven banks identified as G-SIIs in 2018 are not among the top 30 banks by cross-jurisdictional claims.

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cross-border exposures could also introduce a penalty on these activities in comparison to domestic activities, which could, all other things being equal, serve to reinforce the bank-sovereign nexus in Europe. In this regard, geographical diversification may also have advantages along the financial stability dimension. However, addressing the bank-sovereign nexus constitutes a separate area for policy action which goes beyond the scope of this report.[36]

Turning to funding and liquidity risks, microprudential measures like the liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR) may fail to fully capture global systemic liquidity risks. The LCR and NSFR have been added to the regulatory framework to tackle liquidity risk at individual institutions. However, their microprudential orientation may be inadequate to cover systemic liquidity risk that may arise as a result of interconnectedness among global financial institutions (European Central Bank (2018)). A natural way to adapt the existing LCR and NSFR designs to account for system-wide and global drivers of liquidity risk would be to incorporate macroprudential elements such as time-varying ratio levels as proposed by the European Systemic Risk Board (2014) or the differentiation of liquidity requirements according to the systemic importance of banks (Clerc et al. (2016)). Proposals that go beyond existing tools include the following: a Pigovian tax on short-term funding (Perotti and Suarez (2011)) to regulate systemic risks associated with banks' short-term funding; and a macroprudential liquidity buffer (Hardy and Hochreiter (2014)), requiring banks to hold a minimum amount of "systemically liquid assets" whose value is not correlated with the state of the financial system and thus can be quickly sold in times of crisis without losses or used as collateral.

A related policy issue is how macroprudential policies can affect the liquidity management of global banks. After the global financial crisis, several regulatory proposals have been put forward to impose restrictions on the ability of financial institutions to conduct liquidity management at a global level. These include measures to ring-fence certain activities or jurisdictions, or to create local liquidity pools (e.g. Committee on the Global Financial System (2010)).

To address currency mismatches, prudential authorities can define liquidity requirements (LCR or NSFR) by currency, which would be allowed by the OECD Code of Liberalisation of Capital Movements. Currency mismatches in the balance sheets of global banks are one of the main transmission channels of the global financial cycle to domestic open economies. Indeed, a recent assessment of the effectiveness of the LCR in mitigating currency risk shows that several EU banks with significant dollar funding fall short of the current LCR requirements for their USD-denominated balance sheet items (European Banking Authority (2019)).[37] The introduction of prudential liquidity requirements to global banks by currency can limit that channel and contain the transmission of financial vulnerabilities originated globally.[38] On the other hand, introducing prudential liquidity requirements by currency may affect the cross-border operations of EU banks and may discourage some of these operations.

Macroprudential authorities need to pay closer attention to global non-bank financial institutions, starting with the access to granular information and considering the variety of

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[36] For further information on the bank-sovereign nexus, see Lane (2012), European Systemic Risk Board (2015a and 2018c) and Dell'Ariccia et al. (2018), among others.

[37] On the same topic, the ESRB issued a recommendation in 2011 to address the funding of European banks in US dollars and the related financial stability concerns (European Systemic Risk Board (2011)).

[38] See also European Systemic Risk Board (2015b).

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business models in this sector. Unlike with global banks, further effort is still required to establish a global macroprudential framework for non-banks which can take into account the externalities they create in relation to global systemic risk. A first step would be to improve the information available on cross-border exposures, one of the key proposals by the FSB/IMF/BIS (2011) to the G20 for strengthening the international financial architecture following the global financial crisis. While substantial progress has been made in addressing data gaps in recent years, such as improvements to the BIS international banking statistics that now provide adequate macro-level information on cross-border banking flows, deficiencies remain. The existing gaps pertain in particular to cross-border interlinkages between banks and non-bank financial institutions, which are still not covered comprehensively across jurisdictions and sectors, and to the nature of institutions classified in the residual category in breakdowns of the non-bank sector. In principle, many national authorities already collect data on these exposures for the banking and non-banking sectors in their respective jurisdictions. These data are not shared internationally with other authorities, however, thus prohibiting an all-encompassing assessment of the system-wide risks stemming from non-bank financial institutions. Closing these gaps will therefore require a large degree of coordination among international regulatory and supervisory authorities, leading to an important role for global organisations such as the BIS, FSB, IMF and IOSCO (and ESMA within the EU). Once data gaps are closed, macroprudential authorities would collectively be in a sound position to assess how non-bank financial institutions can contribute to the build-up of systemic risks. From there, the development of a macroprudential toolkit for non-bank financial institutions could be a seen as a natural next step, taking into account the variety of business models and institutions within this sector.

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4 Conducting macroprudential policy in an open economy subject to global systemic risk

This report has shown that the global financial cycle affects EU economies via capital flows, credit growth, credit spreads and property prices, reducing the ability of policymakers to influence domestic financial conditions independently from global trends. Given a strong global component in asset prices, credit and capital flows, the effectiveness of domestic policies may decline and the potential for international policy spillovers increase. Hence:

1. global risks increasingly matter for EU financial stability as the transmission of cross-border shocks increases;

2. monetary policy decisions outside the EU, in particular the United States, influence the EU banking sector;

3. financial conditions and policies in the EU can influence the behaviour of financial intermediaries in other areas of the world, which may indirectly influence the EU risk environment via "spillbacks".

The global financial cycle is interrelated with the behaviour of global financial institutions – banks and non-bank financial intermediaries – that contribute to cross-border shock transmission, giving rise to financial stability concerns. The global weight of EU banks has declined since the global financial crisis, and non-bank financial intermediaries are growing in size and interconnections with both the financial system and other parts of the world.

Policy decisions in core global economies (the United States, the euro area, Japan, the United Kingdom and China) determine the global financial cycle and are simultaneously affected by it. The previous discussion identified the monetary policy stance in core economies and global risk perceptions as the key factors to define the global financial cycle. In addition, the activities of global non-banks and the risk-taking and liquidity management of global banks may influence the dynamics of the global financial cycle. Policymakers in the core economies must respond to this new environment. At the same time, their policy decisions may shape the global financial cycle.

The institutional design of macroprudential policy in the EU, conducted by national authorities, implies that each EU economy may be considered as an open economy from a global perspective. Macroprudential policy in the EU is conducted by national macroprudential authorities that are typically councils or committees composed of different national bodies (e.g. the central bank, ministry of finance and financial conduct authority). The ESRB is responsible for EU-wide macroprudential oversight. Its members come from EU central banks, the European Commission, national supervisory authorities and other EU regulators. In EU law, the ESRB is an information hub through which relevant information and data on systemic risk and macroprudential policies are shared across EU Member States. Moreover, the ESRB operates as a coordinating body, providing frameworks for reciprocation of national measures within the EU and frameworks for recognising and setting countercyclical buffer rates for exposures in third countries. By issuing warnings and recommendations to Member States, the ESRB has soft law tools at its disposal to enforce policy actions. Next to national authorities and the ESRB, the European Central Bank

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(ECB) is another important authority in the EU institutional framework for macroprudential policy. The ECB's mandate covers euro area countries whose national authorities are obliged to notify the ECB if they have the intention to adopt macroprudential measures under the Capital Requirements Directive and the Capital Requirements Regulation. The ECB can object to any intended measure and has the topping-up power to apply higher capital buffers or more stringent bank-based measures if this is deemed necessary. Based on the stylised overview in Figure 3, this section starts with a discussion of the effectiveness of macroprudential policy to address risks and vulnerabilities stemming from global financial conditions by raising resilience. It continues with a discussion of cross-border spillovers of macroprudential policy and the desirability of international macroprudential policy coordination and concludes with a short reflection on the use of capital flow management measures for financial stability purposes.

Figure 3

Macroprudential policy and its global dimensions
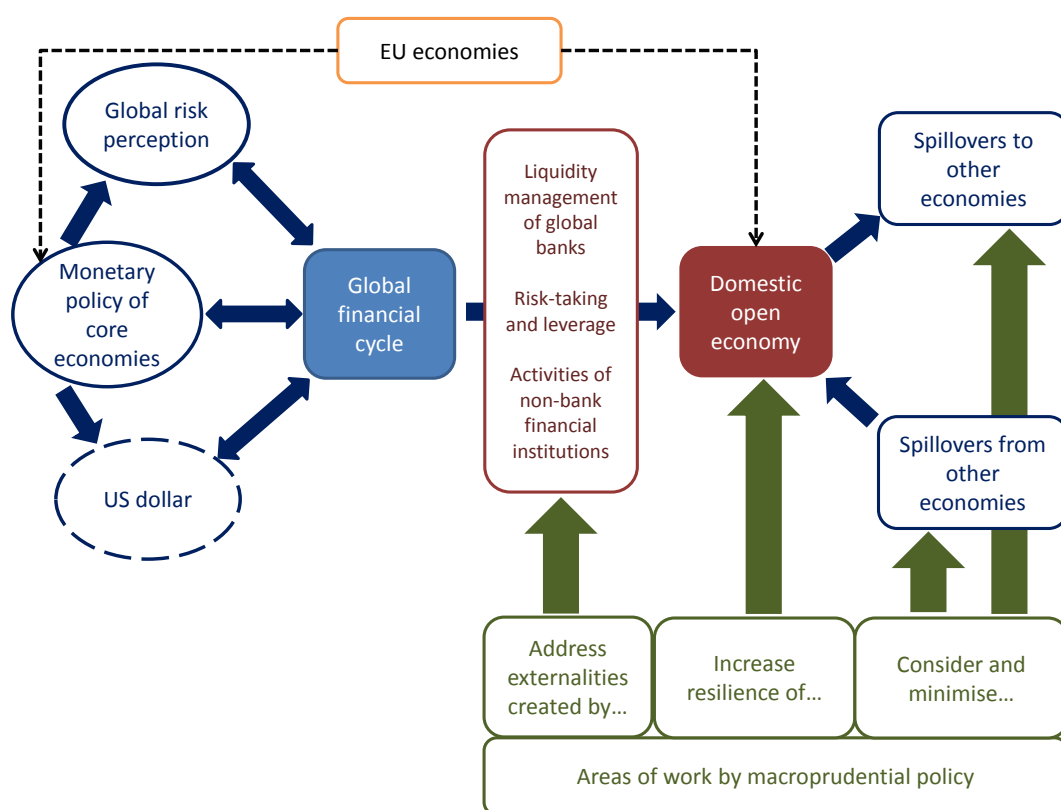
Notes: The thicker line around the global risk perception highlights its higher importance in driving the global financial cycle. Similarly, the particular bidirectional relationship between the global financial cycle and the US dollar is shown by a dashed line.

4.1 The global financial cycle and the effectiveness of domestic macroprudential policies

In a global context, the focus of macroprudential policy should be on protecting domestic financial systems from shocks originating at the global level rather than modifying the drivers of the global financial cycle. While domestic macroprudential policies in isolation cannot

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influence the global dynamics of credit and asset prices, they may be effective in mitigating the impact of the global financial cycle on domestic financial cycles and financial stability by increasing domestic resilience. Furthermore, while macroprudential policy and monetary policy are conducted separately, it is important to take into account possible interactions between them and to reflect on the potential need for coordination between policy domains (Portes (2014), Cecchetti (2018), Richter et al. (2018), Martinez-Miera and Repullo (2019) and Takáts and Temesvary (2019b)). For example, tax deductibility of mortgage payments, being within the remit of fiscal policy, may play an important role in increasing vulnerabilities in the residential real estate sector (European Systemic Risk Board (2016a)).

Although mostly limited to the period after the global financial crisis, there is evidence that macroprudential policies are effective in mitigating financial cycles. Most of the academic literature discussing the effect of macroprudential policy only considers the most recent years, given the important development of this field in the wake of the global financial crisis. However, macroprudential policy can mitigate the adverse effects of the domestic financial cycle (see Galati and Moessner (2018) for a comprehensive review of the existing literature, and Alam et al. (2019) and Poghosyan (2019) for two recent contributions). Aikman et al. (2019) conduct a counterfactual exercise on the global financial crisis to understand whether macroprudential policy might have been able to prevent it. While they are concerned that macroprudential authorities may not be able to grasp fully the systemic nature of financial risks as they emerge, they conclude that macroprudential tools would have been effective in (i) increasing the capital position of banks (through a countercyclical capital buffer), (ii) limiting their reliance on short-term debt (through a net stable funding ratio), and (iii) dampening the development of prices in the real estate sector (through borrower-based measures).

Furthermore, empirical evidence suggests that macroprudential policies can be effective in mitigating the transmission of the global financial cycle to domestic economies. The previous section has already indicated that the introduction of prudential liquidity requirements to global banks by currency can contain the transmission of financial vulnerabilities originated globally. In addition to it, Aizenman et al. (2018) investigate whether macroprudential policies affect the financial link between core economies (in this case, the United States, Japan and the euro area) and a number of peripheral economies. The authors use the estimated correlation of the policy interest rate between the two types of countries as a measure of the strength of the financial link. In the second step, the authors define a regression of this financial link measure with a number of possible country-specific determinants, including a variable representing the range of macroprudential policies. The results suggest that more extensive macroprudential policies favour greater monetary independence for peripheral countries when the core economies implement expansionary monetary policy, when they have a current account deficit, and when they hold lower levels of international reserves. The paper concludes that macroprudential policies can be useful to achieve financial stability independent from the three policies in what is known as the "financial trilemma". Related to this, Takáts and Temesvary (2019a) document that macroprudential measures implemented in borrowers' host countries were successful in reducing the negative cross-border effects of the US "taper tantrum" in 2013. According to their analysis, macroprudential policies stabilised cross-border lending to both banks and non-banks. Similarly, Adrian et al. (2019) document that the transmission of the global price of risk, captured by a non-linear function of

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the VIX, to country-specific macroeconomic outcomes is mitigated by a country's degree of macroprudential regulation.[39] Consistent with these findings, Avdjiev et al. (2017a) show how prudential instruments such as local currency requirements reduce the sensitivity of cross-border bank loans to global risk factors. This empirical analysis reveals that, in most central, eastern and south-eastern European (CESEE) countries considered, private sector credit growth reacts negatively to a macroprudential policy (MPP) tightening shock; this effect is particularly pronounced in the period before the global financial crisis. In most cases, the levels of gross capital inflows also respond negatively to macroprudential tightening. This effect is especially pronounced (a) for other investment inflows (largely reflecting direct foreign lending to resident banks), (b) for borrower- and foreign currency-based MPPs, and (c) in the post-crisis period. Finally, the responses of capital flow volatilities to an MPP tightening shock display a more mixed pattern. In the wake of such a shock, volatilities of capital inflows often increase – this is especially true for total capital flows, while the number of negative volatility responses exceeds the number of positive volatility responses for other investment flows. Focused on CESEE economies, the results of Eller et al. (2019) suggest that tighter MPPs could be effective in containing private sector credit growth and the volumes of gross capital inflows, especially bank flows (see Annex 1 for further details).

Table 3 provides some novel evidence on the effectiveness of macroprudential policy in mitigating the transmission of the global financial cycle to domestic household credit growth and property price dynamics. It presents the results of a fixed-effects panel regression analysis considering 39 countries, which includes a measure of the global financial cycle (global risk) and a country-specific indicator of macroprudential stance as independent variables alongside other control variables. The dependent variable is either household credit growth or property price growth (see Annex 2 for the methodology and data). The analysis differentiates between advanced economies and other economies (mostly emerging economies, but also eastern European countries). It is important to highlight that, for the latter group of countries, the experience with macroprudential policies is generally longer and more widespread in the sample period (2000-2017).[40] The results in Table 3 confirm the evidence presented in Section 2, which indicates that global risk is an important determinant of domestic credit growth as suggested by the negative and statistically significant coefficient. Macroprudential policy has a dampening effect on household credit growth and property price growth, but the effect is largely driven by the category of "other and emerging economies". The main coefficient of interest is the interaction term between global risk and the macroprudential policy indicator (*global risk*macropru*) which indicates whether a country's macroprudential stance can mitigate the transmission of global risk shocks to domestic credit growth and property price growth.

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[39] In addition, the stance of domestic monetary policy and the degree of countercyclicality of fiscal policies are mitigating factors for the transmission of global risk to domestic macroeconomic outcomes.

[40] The start of the sample period in 2000 is in line with related studies investigating the impact of macroprudential policies, e.g. Cerutti et al. (2017) and Alam et al. (2019).

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Table 3

The role of macroprudential policy in the transmission of global risk

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. variable	Household credit growth (%)			Property price growth (%)		
Sample	All economies	Advanced economies	Other and emerging economies	All economies	Advanced economies	Other and emerging economies
GDP growth	0.188***	0.050***	0.222***	0.034***	0.045*	0.047*
Inflation	0.001	-0.031	0.008	-0.035	0.011	-0.049
Dom. int. rate	-0.231***	-0.162***	-0.230***	-0.178***	-0.340***	-0.110
Global risk	-0.366***	-0.094***	-0.692***	-0.008	0.003	-0.133
Macropru.	-2.812***	-0.005	-3.753***	-0.382*	0.003	-0.699**
Global risk*macropru.	0.901**	0.173	1.355**	0.077	0.244	0.118
Observations	2,327	1,350	977	2,120	1,297	823
Countries	39	21	18	38	21	17
R-squared	0.90	0.98	0.88	0.91	0.93	0.89

Notes: The model includes four lags of the dependent variable and country-specific fixed effects (not reported for space reasons). All independent variables are lagged one period. Global risk refers to the global financial cycle indicator by Habib and Venditti (2019), which is based on a global stock market factor for 63 advanced and emerging economies. "Macropru" is the aggregate country-level indicator of macroprudential policy according to the integrated Macroprudential Policy (iMaPP) database (Alam et al. (2019)). The sample period is Q1 2000-Q1 2017. See Annex 2 for a detailed discussion of the methodology and data. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

The results largely suggest that a tighter macroprudential stance has a dampening effect on the transmission of global risk, as shown by the positive coefficients for the interaction term in all specifications. The dampening effect is particularly strong for household credit growth in the group of "other and emerging economies", while the effect on advanced economies is more limited. For property prices, the coefficients of the interaction term are positive, but not significant. Hence, while the results in Table 3 suggest that macroprudential policies play a role in mitigating the pass-through of global risk to domestic economies, the evidence should be interpreted with some caution. There is clearly a need for future research to investigate the effectiveness of macroprudential policy in the context of the global financial cycle. The fact that many countries, in particular advanced economies, began to use macroprudential policy only recently implies that its effects may not yet be clearly identifiable when using currently available historical data.

Based on the results of Table 3, it is possible to construct a rough counterfactual of the impact of the global financial crisis on credit to the real economy if macroprudential policy actions had been in place. Bearing in mind the challenges derived from identifying the impact of macroprudential policies, a way of illustrating the benefits of macroprudential policies is to use the estimated results in Table 3 to construct a simple counterfactual scenario for the global financial crisis. The counterfactual addresses the question "what would have been the impact of global risk on domestic credit growth during the global financial crisis if EU economies had implemented the recent macroprudential policy actions already at that time?" Chart 12 shows a stylised estimate, suggesting that under a similar macroprudential stance as in 2017 (yellow line), the negative impact of global risk shocks on household credit growth would have been considerably lower (roughly one-half of the actual impact).

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Chart 12

Counterfactual analysis of the impact of EU macroprudential policies on the transmission of the global financial cycle during the global financial crisis

Actual impact of global risk on household credit growth
Counterfactual impact of global risk on household credit growth with tighter macroprudential stance
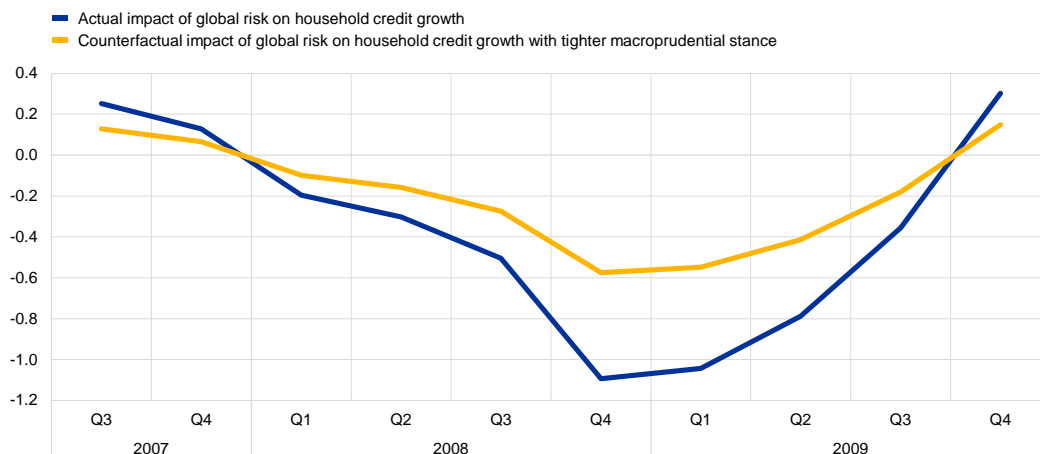
Note: Based on the estimation results in Table 3, the chart compares the actual impact of a shock to global risk on (average) household credit growth in EU economies with the impact in a counterfactual scenario assuming that the 2017 macroprudential stance in EU economies had been in place at the beginning of the crisis. The EU macroprudential stance in 2017 is defined as the cumulative change in the macroprudential indicator of Alam et al. (2019) in the period Q1 2015-Q4 2016 (the latest data points available in the database) and averaged across EU countries. See Annex 2 for the methodology and data.

In the EU regulatory framework, the ability to set up countercyclical capital buffers for exposures to third countries is intended to increase the resilience of EU banks to the materialisation of vulnerabilities in non-EU economies. The current framework for the countercyclical capital buffer (Basel Committee on Banking Supervision (2010)) gives powers to home authorities to require domestically supervised banks to maintain higher buffers if they deem the host authorities' buffer to be insufficient. This requirement is translated into the EU regulatory framework by Articles 138 and 139 of the Capital Requirements Directive, which allow designated authorities in EU Member States to define a countercyclical capital buffer rate for exposures of their domestic banks to third countries, granting the ESRB the power to issue recommendations in this regard.[41] This can therefore be a tool allowing national macroprudential authorities to increase the resilience of their institutions to developments in economies to which they are exposed (namely, core global economies), which would not affect them through direct exposures.

4.2   Cross-border spillovers of policies and international policy coordination

The global operations of banks imply that domestic macroprudential policies may create inward and outward cross-border spillovers, resulting in a potential need for international policy coordination by macroprudential authorities. Buch and Goldberg (2017) define two possible types of policy spillovers.

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[41]   See also European Systemic Risk Board (2016b).

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1. Inward spillovers (leakages): domestic macroprudential measures can give rise to policy "leakages" if bank activities migrate to areas/institutions not subject to the measures such as foreign banks or non-bank financial institutions. Inward spillovers may render domestic macroprudential policy less effective.

2. Outward spillovers: domestic macroprudential measures can induce externalities in other countries through adjustments in the lending behaviour of domestic banks towards foreign borrowers. For example, following a tightening of macroprudential policies at home, domestic banks may respond by increasing/decreasing their lending abroad via subsidiaries or direct cross-border lending.

The empirical literature on cross-border policy spillovers tends to confirm the existence of both leakages and outward spillovers, but the evidence is somewhat mixed as the magnitude and direction of effects seem to depend on the specific circumstances and the framework employed. Aiyar et al. (2014a) use micro data for the UK banking system to examine the effects of time-varying capital requirements on bank lending. They find evidence for policy leakages in foreign branches, which are not subject to domestic capital requirements, increasing lending in response to tighter capital requirements in the United Kingdom. Reinhardt and Sowerbutts (2015) report similar findings based on cross-country data of aggregate banking flows, showing that borrowing by the domestic non-bank sector from foreign banks increases after a domestic tightening of capital measures. However, they do not identify leakages following a tightening of borrower-based measures such as limits on LTV and DTI ratios. This contrasts somewhat with the findings provided in the analysis of bilateral lending flows by Avdjiev et al. (2017b), which suggests that LTV changes and local currency reserve requirements have the most significant positive impact on international bank lending to the domestic country.[42] Buch and Goldberg (2017) discuss the results of a multi-study initiative conducted by the International Banking Research Network. As part of the initiative, researchers from 15 central banks investigated cross-border prudential policy spillovers using micro-banking data from national banking systems. As a whole, the findings for both inward and outward spillovers are mixed: the majority of regression specifications examined across country teams do not exhibit statistically significant international spillovers of prudential instruments. For the specifications in which spillovers are reported, both a positive and a negative impact on credit growth is observed.

Findings in the academic literature on outward spillovers of macroprudential policy actions are mixed regarding the impact on cross-border lending. For the pre-crisis period (1999-2006), Aiyar et al. (2014b) find that UK banks reduced cross-border lending in response to increases in domestic capital requirements. Using more recent and more aggregate cross-country data, Avdjiev et al. (2017b) also report evidence for outward spillovers in relation to borrower-based measures (LTV changes) and, consistent with Aiyar et al. (2014b), domestic banks increased cross-border lending after a tightening of LTV ratios at home.

Changes in domestic or foreign prudential regulation also have cross-border implications for the risk-taking behaviour of global banks. In addition to Aiyar et al. (2014b), Ongena et al. (2013) find evidence for cross-border spillovers from domestic bank regulation on risk-taking

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[42] Similarly, Buesa and Población (2019) assess the transmission of borrower-based measures to macro-aggregates, highlighting the cross-border spillovers generated by domestic measures (see Annex 1 for further details).

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abroad, showing that tighter restrictions on bank activities in home jurisdictions are associated with greater risk-taking by banks abroad in the form of lower lending standards. According to the findings in Franch et al. (2019), domestic banks reduce lending after a tightening of capital requirements in other countries, while foreign subsidiaries increase lending following the tightening of sector-specific capital buffers in the country of the parent bank.

In addition to the role identified in the academic literature for foreign subsidiaries, the potential for cross-border spillovers may be greater in national banking sectors with a material number of foreign branches. The prevalence of foreign branches in a domestic banking system may be relevant in financial stability terms concerning the ability to withstand shocks and lending in that system (European Systemic Risk Board (2019b)). In particular, foreign branches can contribute to macroprudential policy leakages, as they are typically not subject to measures targeting the domestic banking sector, since they are not under the direct supervision of the domestic authorities (Figure 4). In the EU, country-level data on total assets of foreign branches suggest that the prevalence of foreign branches is concentrated in a few countries, most notably Luxembourg, Hungary, Finland and Cyprus (European Systemic Risk Board (2019b)).[43]

Figure 4

Stylised view of spillovers and leakages with the presence of foreign subsidiaries and branches
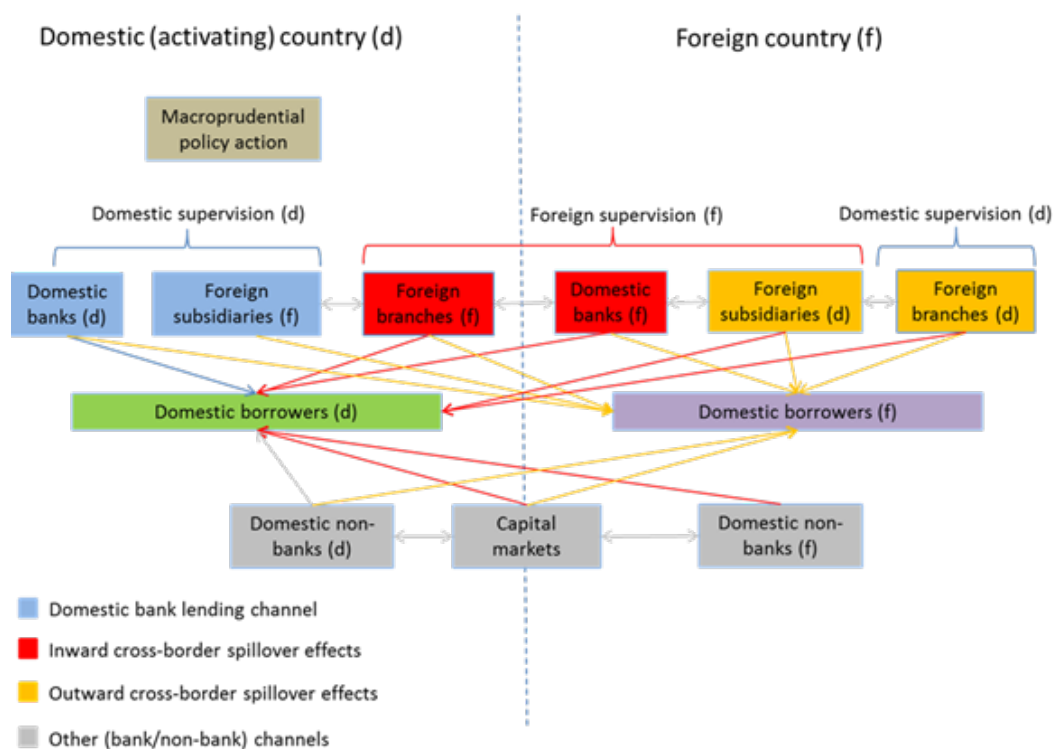
Source: European Central Bank (2019b).

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43 The recent move of Nordea's headquarters from Sweden to Finland may have significantly reduced the importance of foreign branches in the Finnish banking system (while at the same time increasing their importance in Sweden).

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Consequently, policy measures have been taken in the United States and the EU to address potential spillovers and leakages created by branches of third-country banks.[44] In the United States, foreign-owned branches are, with a few exceptions, prohibited from accepting retail deposits from US citizens or residents (Goulding and Nolle (2012)). In the EU, Article 21b of the Capital Requirements Directive requires third-country groups with significant activities in the EU (exceeding €40 billion) to set up an intermediate parent undertaking in the EU.[45]

The potential existence of cross-border spillovers and leakages of prudential policies provides the rationale for stronger coordination of macroprudential policies across borders. International cooperation between macroprudential policymakers and authorities from other policy domains is required to monitor and mitigate the risks in the global financial system (Agénor and Pereira da Silva (2018), Cecchetti (2018) and G20 Eminent Persons Group on Global Financial Governance (2018)). Indeed, Agénor and Pereira da Silva (2019) find that the welfare gains from macroprudential policy coordination are positive for the world economy and they tend to increase with the degree of international financial integration (although they could be asymmetric across regions). The current EU framework provides rules for reciprocation on certain macroprudential measures, notably including the countercyclical capital buffer. Fostering and extending the reciprocation framework, for example by including a broader range of measures and countries (possibly extending it to a global framework), is therefore desirable. While international cooperation within the EU is a realistic goal due to common legal requirements, extending international cooperation to the global setting is much more challenging due to the different standards and institutional arrangements across jurisdictions. A major obstacle to the construction of a global framework for macroprudential coordination is the unclear assignment of responsibilities for macroprudential policy in many countries, including the United States. Therefore, it may be difficult to get all relevant parties to the discussion table (Cecchetti and Tucker (2015)). At a regional level, macroprudential authorities may wish to establish coordination similar to that created in the Nordic-Baltic region, whereby an informal coordination forum has been established and a Memorandum of Understanding has been agreed. This contains various elements and principles for supervision of significant branches and crisis management with respect to cross-border groups with one or more significant branches, under a microprudential and macroprudential perspective (for further details, see also European Central Bank (2019b)).

4.3 Using capital flow management measures for financial stability purposes

The use of capital flow management measures to achieve financial stability objectives has been the subject of renewed debate in the wake of the global financial crisis. While there may be other motivations for capital flow measures, the debate on whether they could be used to achieve macroprudential objectives has expanded recently. The main question is whether policymakers should only target capital flows directly as a crisis management tool (as in the recent

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[44]   The Icelandic banking crisis provides a good example of the macroprudential challenges posed by the operations of domestic banks in third countries through branches. For further details, see Baldursson et al. (2018).

[45]   **Directive (EU) 2019/878 of the European Parliament and of the Council of 20 May 2019 amending Directive 2013/36/EU as regards exempted entities, financial holding companies, mixed financial holding companies, remuneration, supervisory measures and powers and capital conservation measures**.

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examples of Cyprus, Greece and Iceland)[46] or if they should be more actively managed (Beirne and Friedrich (2014), Engel, (2015), Bauer et al. (2016) and De Crescenzio et al. (2017)). In the latter case, capital flow management should have a role in crisis prevention and therefore would target every stage of the financial cycle through appropriate policy measures, such as Pigouvian taxes (Jeanne and Korinek (2010)), countercyclical reserve requirements (Agénor et al. (2018)) or limits on foreign exchange transactions to those supporting underlying trade and investment activities.[47] In the real estate sector, measures targeting capital flows can support financial stability during capital inflow surges when other policy options are limited or timing is important (International Monetary Fund (2019)). Recent measures taken in New Zealand and Australia regarding foreign buyers of real estate could help to address financial stability concerns about developments in the domestic real estate markets (typically, foreign investors are not subject to macroprudential or microprudential regulation).[48]

Some recent papers in the academic literature point to negative aspects of the use of capital flow management measures to address financial stability concerns.[49] The process of financial globalisation has led to academics paying more attention to capital flow measures in general, and to the effectiveness of capital flow measures to achieve financial stability objectives in particular. According to the analysis by Forbes et al. (2015), macroprudential measures can significantly reduce some measures of financial fragility, but capital flow measures are not usually able to achieve their stated objective. Pasricha et al. (2018) find that tighter capital inflow restrictions may generate significant spillovers, especially in the aftermath of the global financial crisis in an environment of abundant global liquidity. The introduction of capital flow policies can also generate spillovers to similar economies, as documented by Giordani et al. (2014) and Gori et al. (2019).

The amended Code of Liberalisation of Capital Movements (Organisation for Economic Co-operation and Development (2019a)) clarifies the treatment of macroprudential measures related to capital flows. For a macroprudential measure to fall within the scope of the Code of Liberalisation, it must target the specific operations it covers (List A and List B). Having an impact on capital flows is not enough to bring macroprudential measures within the scope of the Code of Liberalisation. Those macroprudential measures that relate to capital flow management may be in line with the Code of Liberalisation (due to carve-outs or explicit understandings reached among adhering countries) or may lead to a reservation or derogation. The fact that a macroprudential measure is considered a restriction in the free movement of capital does not imply that it is not justified for financial stability (or any other) reasons. The revised Code of Liberalisation gives adhering countries full discretion to regulate the overall net foreign exchange positions of domestic financial institutions and states that Basel III-type liquidity ratios (LCR and NSFR), even if defined by currency, are not considered restrictions. Only measures to address an excessive dependence on short-term foreign currency liabilities (including reserve requirements by currency) must be analysed on a case-by-case basis (Organisation for Economic Co-operation and Development (2019b)).

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[46] For the Icelandic case, see Baldursson et al. (2018).

[47] See Blundell-Wignall and Roulet (2014) for a wider set of examples of these policies.

[48] See news articles on **New Zealand** and **Australia**.

[49] See Guichard (2017) and Rebucci and Ma (2019) for a comprehensive review of the related literature.

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In certain cases, capital flow measures may be an effective macroprudential instrument, as acknowledged by the IMF's Institutional View (International Monetary Fund (2012, 2018b)). The IMF's Institutional View, which applies to capital flow management measures, acknowledges that the optimal combination depends on country-specific circumstances. Some such measures may be considered macroprudential measures if there is a potential source of systemic risk from capital flows. While the IMF's Institutional View states that capital flow management measures will rarely be the only adequate policy response, it identifies several circumstances in which they may be appropriate (International Monetary Fund (2018b)). In this regard, the G20 Eminent Persons Group on Global Financial Governance (2018) has called on the IMF to evolve and extend its Institutional View to benefit from capital flows while managing risks to financial stability. In particular, the amended Institutional View should consider the drivers of capital flows and their interaction with monetary, exchange rate and macroprudential policies, and the assessment of the receiving country's capital flows at risk and macro-financial stability. In the context of the Icelandic banking crisis, Baldursson and Portes (2014) discuss the role of capital flow management measures in the resolution of the failed cross-border Icelandic banks and argue that any costs of these measures should be weighed against the risk that massive capital flight would endanger financial stability and national solvency.

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5   Concluding remarks

This report has built a narrative to highlight the importance of external factors for the conduct of domestic macroprudential policy. It provides evidence suggesting that capital flows and asset prices across the globe have displayed positive co-movement in the past three decades, underscoring the existence of a global financial cycle which influences economies' domestic financial conditions. Moreover, globally active banks and non-bank financial intermediaries play an important role as generators, transmitters and receivers of cross-border shocks in the global financial system.

Domestically, macroprudential policy is an effective response to the externalities created by global financial institutions, and it can increase resilience to global vulnerabilities, but macroprudential measures are subject to spillovers that may impair their effectiveness. Monetary policy decisions in core global economies may generate spillover effects around the world via a global risk-taking channel of monetary policy.[50] Banks operating in more than one jurisdiction can serve as transmitters of these spillovers through their funding and lending decisions. At a regional level, there may be spillover effects from domestic macroprudential policy decisions to neighbouring economies, possibly affecting cross-border lending and shifting vulnerabilities to other economies. The effectiveness of macroprudential policies may diminish if these spillover effects are ignored. Reciprocation agreements and regional coordination among macroprudential authorities in general can reduce the size and importance of cross-border spillover effects. In certain circumstances, capital flow measures can be effective in achieving financial stability objectives, as identified by the International Monetary Fund (2012, 2018b).

The influence of core economies on the global financial cycle warrants close monitoring of developments by EU macroprudential authorities. While the United States is usually considered the hegemon of the international monetary system, it is not the only economy with the capacity to influence the global financial cycle. The weight of the euro area, the United Kingdom, Japan and China in the global financial landscape also affects the global financial cycle. EU macroprudential authorities should therefore closely monitor developments in these core economies (beyond direct banking exposures), as they could indirectly affect domestic financial conditions through their influence on the global financial cycle. Furthermore, macroprudential authorities would be well advised to assess the consequences of future potential shifts in the global financial landscape, with China gaining prominence. This task becomes more important considering the powers given by the European legislators regarding the definition of countercyclical capital buffer rates for exposures to third countries.

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[50]   For example, Fischer (2014) warned that European monetary policy should also be taken into consideration here, given the significant cross-border activities of European banks, and Rajan (2014) raised concerns about the spillover effects of monetary policy in the United States and the euro area on emerging economies, like India.

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Annex 1: Summary of related research projects[51]

"Retrenchment of euro area banks and international banking models" (Argimón et al. (2019))

This research provides evidence of the relevance of banks' global business models as a determinant of the retrenchment in foreign claims of the euro area banking system since the global financial crisis. Using BIS consolidated banking statistics, the change in the bilateral stock of total foreign claims before (2005-07) and after (2014-16) the global financial crisis between each euro area country and any other country is studied. In line with the classification of McCauley et al. (2010), the global business model of a given euro area country banking system is defined along two different but related dimensions: operational and funding.

Along the operational dimension, a bank's (or banking sector's) global business model can be classified as multinational or international. The difference lies in how banks operate in the host country. Multinational banks tend to develop local business in host countries (through either branches or subsidiaries), while international banks conduct mostly cross-border business with non-residents without establishing affiliates abroad. The regression analysis in Table A.1 suggests that multinational banking systems reduced their foreign claims less during the crisis.

The research further studies whether the changes in the euro area countries' banking system characteristics and the degree of macroeconomic synchronicity between the home and the host countries influence the retrenchment in foreign claims, and whether the global operational business model exacerbates/mitigates those effects. It considers the changes between the pre- and the post-crisis period in two characteristics: distance-to-default (DtD, as captured by the z-score) and the relevance of the traditional banking activity (TraditionalActivity, proxied by the loan-to-deposit ratio). Bilateral synchronisation is computed as the negative difference, in absolute terms, between the GDP growth rates in the home and host countries, weighted by the share that the host country has on the total foreign claims of the home country for the period 2003-05. Findings suggest that those banking systems that have increased their distance-to-default and those that have moved away from traditional activity have retrenched more. In addition, it shows that higher synchronisation results in higher retrenchment, but also that the multinational model mitigates this effect. By contrast, neither the multinational nor the decentralised models reinforce or mitigate the effects of changes in bank characteristics.

Under the funding dimension of a bank's global business model, banks can be classified as centralised or decentralised, depending on the origin of the funding sources used in their foreign banking activity. A centralised bank raises funds at major offices and redistributes them around the group through intrabank lending. In contrast, a decentralised bank operates in such a way that affiliates raise funds locally to finance local activity abroad, meaning that they have

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[51] These summaries appear by alphabetical order of the first author. The views and opinions expressed by the authors of these research pieces do not necessarily reflect the official viewpoint of their employers or the Eurosystem. Furthermore, the inclusion of the research pieces in this report does not automatically imply any endorsement or review of their content by the Advisory Scientific Committee of the ESRB or any of its members.

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substantial autonomy to finance assets in each location. Table A.1 provides evidence that decentralised systems experience less retrenchment than those that raise funds at major offices and redistribute them around the banking group. It also suggests that the decentralised global funding business model mitigates the negative effect of higher synchronisation on foreign claims and helps to contain the decline in these claims for those banking systems that reinforced their resilience after the crisis.

Table A.1

Results of the regression analysis

	(1)	(2)	(3)	(4)	(5)	(6)
Global Banking model variables						
Dummy for operational model (1: multinational; 0: international)	0.549*** (7.7e-0.5)	0.538*** (0.000581)	0.531*** (0.000481)			
Dummy for funding model (1: decentralised; 0: centralised)				0.365** (0.0128)	0.265 (0.110)	0.341** (0.0318)
Role of changes in home country banking characteristics						
ΔDtD (z score)	-0.0849*** (2.86e-08)	-0.0890*** (9.87e-08)	-0.0170*** (0)	-0.0878*** (7.85e-09)	-0.0955*** (7.88e-09)	-0.0166*** (0)
ΔTraditionalActivity	0.0155*** (5.56e-10)	0.0159*** (7.95e-10)	0.204*** (0)	0.0151*** (1.28e-09)	0.0158*** (8.22e-10)	0.198*** (0)
*ΔDtD*Dummy for operational model*		0.0351 (0.255)				
*ΔTradtionalActivity*Dummy for operational model*		-0.00491 0.307)				
*ΔDtD*Dummy for funding model*					0.0710** (0.0242)	
*ΔTradtionalActivity*Dummy for funding model*					-0.00548 (0.291)	
Synchronisation						
Synchronisation			-0.0748*** (0.000370)			-0.0707*** (8.46e-06)
*Synchronisation*Dummy for operational model*			0.0432* (0.0549)			
*Synchronisation*Dummy for funding model*						0.0371** (0.0438)
Macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Regulatory controls	Yes	Yes	Yes	Yes	Yes	Yes
EA dummy variable	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,112	1,112	1,112	1,112	1,112	1,112
R-squared (corrected)	0.312	0.311	0.324	0.314	0.315	0.322

Source: Argimón et al. (2019).
Notes: This table shows the impact of banks' global business models on the retrenchment of the euro area banking system. The dependent variable is the log difference of the total stock of bilateral claims before (2005-07) and after (2014-16) the global financial crisis. The global business model is studied in two dimensions: operational (columns (1)-(3)) and funding (columns (4)-(6)). For each bilateral relation, a home country is classified based on its position for the period 2003-05 relating to the ratio of total local claims over total claims and local liabilities over total local claims for the operational and funding dimensions respectively. Columns (1) and (4) test for the direct effect of each dimension, while columns (2) and (5) include the interaction of

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To sum up, this research finds that the resilience of foreign banking claims could be strengthened by promoting a shift in banking models towards a multinational and decentralised global version that concentrates its foreign exposures on countries with limited business cycle synchronisation with the bank's home country.

"An assessment of the global impact of European LTV/DSTI caps" (Buesa and Población (2019))

This research assesses the impact of macroprudential measures, such as loan-to-value (LTV) and debt service-to-income (DSTI) caps, imposed in one or more European countries, on the rest of the world economies. To that end, to calibrate the credit shocks derived from the caps imposed in European countries, micro-level data from the Household Finance and Consumption Survey (HFCS) are combined with a global VAR (GVAR) modelling approach in order to assess the effects of the shock on macro-financial variables in world economies.

The results show that LTV or DSTI caps calibrated as negative credit demand shocks have negative effects on GDP, usually restricted to the quarters immediately after the shock, and alter inflation in the short run (Chart A.1). Output quickly recovers in line with an improvement in credit markets, which reflects the restrictions on low quality credit implied by the activation of a macroprudential measure, which is beneficial for the economy as a whole.

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Chart A.1

Average response of domestic variables to local shocks (LTV/DSTI) in selected euro area countries

(percentages)
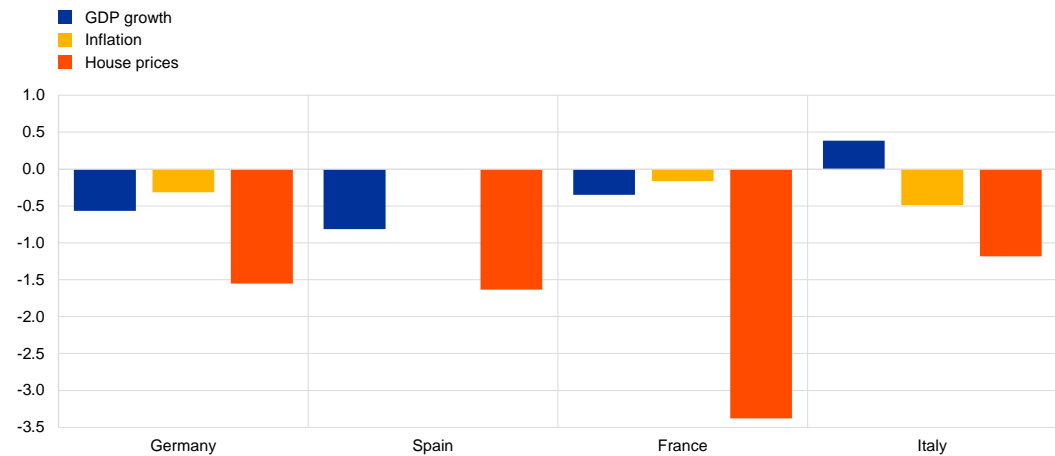
Source: Buesa and Población (2019).

Moreover, these credit demand shocks in euro area countries have spillovers to other economies. In the case of the United Kingdom, credit demand shocks cause small but noticeable increments in GDP and credit growth in the very short run due to a substitution effect in credit markets as well as an improvement of the economic situation over the euro area country activating the measure. The United States benefits from the aggregate contraction in GDP growth in the euro area, thus experiencing a modest rise in its own figures (smaller than for European countries), which disappears within one and a half years. The response of Japan is distinct owing to its particular nature in terms of persistent negative inflation and secularly low and stable lending rates.

When an aggregate scenario is considered, the impact in large euro area economies is similar to the responses to an individual shock in one of them (with the obvious difference that now the shock is larger and hence responses are amplified), and the impact on external economies is more pronounced due to the accumulation of trade flows (Chart A.2). In the United Kingdom, the impact on the flow of credit is stronger than in Japan and United States. The persistent deterioration of economic conditions in the euro area, combined with the strong trade linkages with the United States, boosts activity to the point of gaining growth beyond eight quarters. In this case, credit increases in response to GDP growth and lower lending rates. In the United States, the decrease in lending rates also induces faster credit growth in the first few quarters. As the fundamentals of the main US trading partner as a whole are compromised, prospects for output growth, conversely, are not as positive as in the case of a domestic shock in Europe. Finally, Japan remains broadly stable aside from the strong decline in credit, which originates from the GVAR specification and the particular characteristics of its local lending rate and inflation.

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Chart A.2

Average response of domestic variables to euro area shocks (LTV/DSTI)

(percentages)

Legend:
- GDP growth (blue)
- Inflation (yellow)
- Lending rate (orange)
- Credit (green)
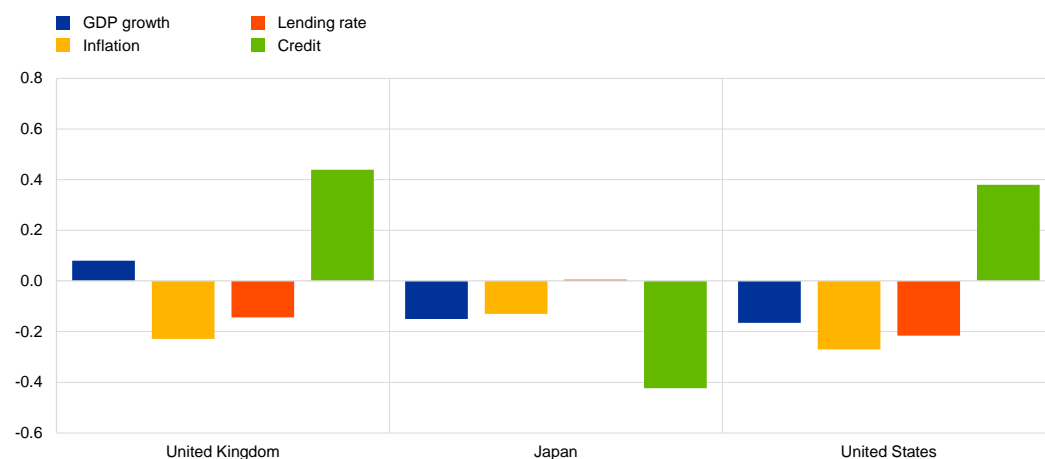
Source: Buesa and Población (2019).

"More trade, more portfolio investment? Evidence at the country-industry level" (Della Corte (2019))

Despite the high degree of financial integration across international stock markets, substantial heterogeneity persists in the geographical allocation of globally active equity investors, which is difficult to reconcile with diversification needs. The empirical literature on international investment patterns instead identifies geographical factors and especially trade linkages (Lane and Milesi-Ferretti (2008)) as important determinants of bilateral portfolio equity investment, with significant implications in terms of financial risk distribution. The correlation between commercial relationships and portfolio allocation is usually justified by citing the role played by information asymmetries in limiting foreign investments, in the spirit of Portes and Rey (2005): more intense trade linkages between two countries would reduce bilateral information barriers, thus encouraging bilateral investment.

However, the debate remains open on whether the information spillover effects induced by trade specifically concern the firms or industries involved, or the trading partners' economies in general. To shed light on this relationship, this research provides new empirical evidence at a more micro-level. Using granular data on portfolio equity holdings by investors in euro area countries, matched with detailed data on trade flows, it estimates the effect of trade ties on cross-border equity portfolio at the country-industry level in the context of an otherwise standard model of financial gravity (Okawa and Van Wincoop (2012)).

The main finding is that, at this lower level, the effects are generally negligible, meaning that investors do not appear to tilt their portfolios towards foreign industries that weigh more in their country's trade patterns (Table A.2). Therefore, the importance of trade ties does not appear to emanate from industry-specific learning. At the same time, past findings of economically important effects of trade linkages on equity investment at the country level are confirmed, although

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they appear to be lower than previously estimated if more robust econometric techniques are employed, in particular the Poisson pseudo-maximum likelihood estimator suggested by Santos Silva and Tenreyro (2006). Moreover, these effects are substantially stronger for investors resident in the euro area than for other investors, also controlling for the greater financial integration within the euro area.

Table A.2

Elasticity of portfolio equity holdings to trade at the country-industry level

Dependent variable: equity holdings$_{i,j,k}$	(1)	(2)	(3)	(4)
Log(trade$_{i,j,k}$)	0.04 (0.03)	0.03 (0.02)	0.05* (0.03)	0.01 (0.01)
Log(distance$_{i,j}$)	-0.07 (0.19)	0.17 (0.17)	0.17 (0.17)	
Common border$_{i,j}$	0.56*** (0.16)	0.47*** (0.13)	0.55*** (0.12)	
Time difference$_{i,j}$	-0.03 (0.13)	-0.10 (0.11)	-0.08 (0.11)	
Common language$_{i,j}$	0.85*** (0.32)	0.66** (0.33)	0.08 (0.51)	
Colonial linkages$_{i,j}$	-0.20 (0.17)	-0.23 (0.14)	-0.13 (0.12)	
Common legal origin$_{i,j}$	0.02 (0.11)	-0.08 (0.12)	-0.37*** (0.13)	
Bilateral Investment Treaty$_{i,j}$	-0.15 (0.13)	-0.14 (0.12)	0.09 (0.20)	
Correlation in output growth$_{i,j}$	-0.15 (0.34)	-0.37 (0.30)	0.10 (0.40)	
Common religion$_{i,j}$	0.72** (0.30)	0.57** (0.26)	0.37 (0.33)	
Log(trade$_{i,j}$)		0.48*** (0.16)	0.66*** (0.16)	
Cultural distance$_{i,j}$			-0.39** (0.19)	
Correlation in stock returns$_{i,j,k}$			-0.12 (0.34)	
Fixed-effect holder country-sector-industry	yes	yes	yes	yes
Fixed-effect country-industry of issuer	yes	yes	yes	yes
Fixed-effect country pair	no	no	no	yes
No holders (country-sector)	56	56	40	56
No host countries	75	75	29	75
No host country-industry	1,414	1,414	296	1,414
Pseudo R-squared	0.94	0.94	0.94	0.95
Observations	65,633	65,633	10,435	58,646

Source: Della Corte (2019).
Notes: Estimates by Poisson pseudo-maximum likelihood of the model $equity_{ijkh} = exp(\alpha_{ik} + \alpha_{jhk} + \beta\,X_{ij} + \gamma\,log(trade_{ijk}) + \varepsilon_{ijkh})$ where the dependent variable $equity_{ijkh}$ is the value of equity (in millions of euro) issued by firms in the industrial sector k of country i held by the holder sector h resident in country j in 2014. The investor countries are the euro area countries. Offshore

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Overall, these results have two important implications. First, from the point of view of the investor country, they imply that the cross-border financial exposure via equity holdings is indeed higher overall than in its trading partners. However, it is not proportionally higher towards those specific industries that, because of stronger trade linkages, are more likely to propagate real shocks between the two economies. Second, from the point of view of the issuer country, it suggests that all industries benefit proportionally, in terms of capital inflows, from greater trade openness.

The paper also explores differences in terms of determinants of bilateral investment among the main institutional holder sectors (banks, investment funds, other financial intermediaries and households). The household sector is the only one for which the language barrier significantly affects investment choices. As opposed to what holds for the other sectors and on average, households also show a tendency, albeit limited, to invest more in foreign industries that have more intense business relations with the country of residence.

Two tales of foreign investor outflows: Italy in 2011-12 and 2018" (Della Corte and Federico (2019))

The large cross-border capital flows observed during the euro area crisis were the root cause of the financial market fragmentation observed during those years (Kräussl et al. (2016)). In the case of Italy, there was a sudden stop in foreign inflows into government debt securities between July 2011 and July 2012, with non-residents (excluding the Eurosystem) selling about 32% of their initial stock. Italy was also hit by a second bout of sovereign bond turmoil starting in May 2018, with tensions only subsiding at the beginning of 2019. In this episode, non-residents disposed of €90 billion worth of government debt securities (about 12% of their initial stock, Chart A.3, left panel). Although it was on a much smaller scale than the former and did not have systemic features, the 2018 episode was nonetheless characterised by a similar combination of capital outflows and tensions in the sovereign debt market. The analysis of these two periods thus provides important insights into changes in the financial landscape and investor behaviour.

A key difference between the 2011-12 and the 2018 episodes relates to the bank funding channel. During 2011-2012, the net foreign borrowing of Italian banks for loans and deposits similarly experienced a sudden decline, falling by €130 billion. This event was not exclusive to Italy: other stressed euro area countries also suffered sudden declines in net foreign borrowing by banks. By contrast, significant inflows through the bank funding channel were registered during the 2018 episode (Chart A.3, right panel).

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Foreign investment in Italian public sector securities (left panel) and changes in the Banca d'Italia's TARGET2 balance and balance of payments: 2011-12 and 2018 (right panel), cumulative flows

(EUR billions)
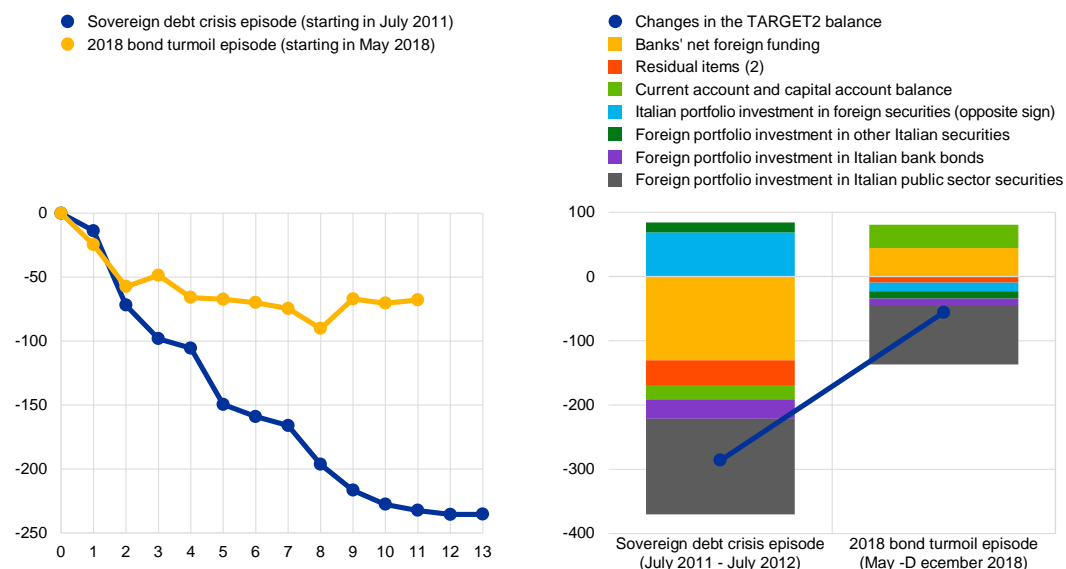
Source: Based on Banca d'Italia and ECB data.
Notes: The left panel excludes net purchases of public sector securities by the Eurosystem; purchases are estimated using public data on the Securities Markets Programme (SMP) and the public sector purchase programme (PSPP). In the right panel, residual items comprise direct investment, derivatives, residual items in other investment, official reserves, and errors and omissions.

This difference is partly attributable to Italian banks being less dependent on international markets for their funding. Their net position on the international interbank market was only a negative 7% of GDP (compared with 21% in mid-2011). Indeed, Italian cross-border banking never recovered from the retrenchment observed for the main EU banking systems in the wake of the global financial crisis and especially the euro area sovereign debt crisis (Emter et al. (2019)). The different developments in the bank funding channel in the two episodes also signal important changes in this market segment. In fact, the inflows in 2018 occurred via the repo market and through the intermediation of a central counterparty. The growing role of these institutions (Mancini et al. (2016)), together with the dominance of collateralised loans after the crisis, might also have helped to fend off a bout of bank funding stress.

It is also informative to analyse the behaviour of euro area investors in times of financial turmoil in the sovereign debt market from 2009 to 2018. First, there is only limited evidence of heterogeneity between the main institutional holder sectors in terms of investment behaviour: all foreign categories tend to pull out of the country during episodes of acute sovereign market stress while all domestic investors tend to repatriate their funds. This suggests that the investor base for government external liabilities may not necessarily be crucial. Second, there is evidence that in the post-crisis period, banks and insurers have become more reluctant to take on more domestic sovereign risk in times of financial turmoil once new prudential regulation has come into force.

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"Capital flows and the stabilizing role of macroprudential policies in CESEE" (Eller et al. (2019))

In line with the recent discussion on the use of macroprudential policy measures to respond to cross-border risks arising from capital flows (e.g. International Monetary Fund (2016, 2017) and Lepers and Mehigan (2019)), this research quantifies the extent to which macroprudential policies (MPPs) have been able to stabilise capital flows in the central, eastern and south-eastern European (CESEE) EU Member States. So far, the empirical impact assessment of MPPs has focused mostly on classical targets (such as "enhancing banking sector resilience" or "taming the domestic leverage cycle") and only rarely on more global dimensions, such as international spillovers, cross-border leakages or, more generally, capital flow responses. Studying the impact of MPPs on capital flows in the CESEE countries is appealing for at least two reasons. First, CESEE has experienced a substantial boom-bust cycle in capital flows. The corresponding credit cycle was pronounced, too. Because of the large reversal of flows (in particular related to bank flows) during the global financial crisis, the CESEE region suffered larger declines in output than any other region in the world (Berglöf et al. (2010)). Second, some CESEE countries such as Bulgaria, Croatia, Poland and Romania had already been quite active in adopting MPPs before the crisis – on the back of extraordinary credit growth, predominantly denominated in foreign currency. This contrasts with the experience of advanced economies with MPPs, which attracted more attention only in the aftermath of the global financial crisis.

To measure MPPs, an intensity-adjusted index is constructed by utilising instrument-specific weighting and aggregation rules (building on Vandenbussche et al. (2015)). It captures both if and to what degree the respective MPP tool was implemented. To study the dynamic responses of capital flows to MPP shocks, a novel regime-switching factor-augmented vector autoregressive (FAVAR) model was applied. This makes it possible to capture potential structural breaks in the policy regime and controls for the impact of global factors – besides domestic macroeconomic quantities – such as the global financial cycle over the period from 2000 to 2018. The question of how MPPs help to shield countries from fluctuations in the global financial cycle is answered by including an estimated measure of capital flow volatility in the dynamic econometric specification (building on Eller et al. (2016, 2018)).

Overall, these results suggest that tighter MPPs do not generally seem to shield CESEE countries from capital flow volatility, but could apparently be effective in containing private sector credit growth and the volumes of gross capital inflows – notably also of bank flows – in most of the countries analysed. The empirical analysis reveals that private sector credit growth reacts negatively to an MPP tightening shock in most of the CESEE countries considered; this effect is particularly pronounced in the period before the global financial crisis. In most cases, the levels of gross capital inflows respond negatively to macroprudential tightening as well. While this is a general observation, this effect is especially pronounced (a) for other investment inflows (largely reflecting direct foreign lending to resident banks), (b) for borrower- and foreign currency-based MPPs, and (c) in the post-crisis period. Finally, the responses of capital flow volatilities to an MPP tightening shock display a more mixed pattern. In the wake of such a shock, volatilities of capital inflows often increase – this is especially true for total capital flows, while positive and negative volatility responses are equally pronounced for other investment flows. Table A.3 illustrates some of these findings across the 11 CESEE EU Member States, highlighting the peak

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responses of different variables concerned to a tightening shock in the intensity-adjusted macroprudential policy indicator.

Table A.3

Peak responses to a tightening shock in macroprudential policies

Country		BG	CZ	EE	HR	HU	LV	LT	PL	RO	SI	SK
Private sector credit growth	Value	-0.16			-0.08	-0.12	0.07		-0.13	-0.12		-0.19
	Horizon	1			6	2	14		1	3		2
Total gross capital inflows (level)	Value	-0.10	0.14	-0.05	-0.07	-0.19	-0.04		-0.18		0.10	0.09
	Horizon	16	7	4	16	4	2		4		6	2
Gross other investment inflows (level)	Value	0.11	0.16	-0.13	-0.09	-0.17	-0.08		-0.16	-0.02	0.07	0.15
	Horizon	3	7	10	14	11	6		4	1	7	5
Total gross capital inflows (volatility)	Value	-0.10	0.23	-0.15	0.12		-0.10		0.07	0.20	0.11	0.15
	Horizon	16	10	6	5		5		1	2	9	2
Gross other investment inflows (volatility)	Value	0.06	0.18		0.09	-0.11	-0.08	-0.07	-0.14	0.06		
	Horizon	3	7		10	3	11	1	6	2		

Source: Eller et al. (2019).
Notes: The table shows the value of peak responses of credit growth, capital inflow volumes (as a % of GDP) and capital inflow volatilities to the identified tightening shock (one standard deviation shock) in the (standardised) overall macroprudential policy indicator, based on FAVAR estimates over the period 2000-2018. Empty boxes indicate insignificant impulse response functions (IRFs) in the sense that the 68% credible interval also comprises zero responses. The value for "horizon" marks the quarter after the shock when the IRF reaches its minimum (negative numbers in red) or maximum (positive numbers in blue). The decision criterion for selecting the peak is always the absolute maximum value (i.e. the larger one is taken in the few cases of changes from negative to positive responses, or vice versa).

"The global capital flows cycle: structural drivers and transmission channels" (Habib and Venditti (2019))

Increasing international financial integration has led to the emergence of a global financial cycle, where financial variables, either flows or prices, increasingly co-move across countries. This global financial cycle, in turn, is related to both financial market volatility and the degree of risk aversion of the market, thus providing a synthetic measure of global risk (Miranda-Agrippino and Rey (2019)). The existence of a global financial cycle has important policy implications. A global financial cycle would drastically limit the ability of policymakers to steer domestic financial conditions away from global trends, for instance by adopting flexible exchange rate regimes and running a monetary policy independent from that of the United States, which sets the pace of global monetary conditions. According to the classical "trilemma" in international macroeconomics, if the capital account is open, it is impossible to run an autonomous monetary policy – i.e. set the policy rate autonomously from that of the core economy – and, at the same time, have an exchange rate target. The global financial cycle would morph this trilemma into a "dilemma", as the policy choice would be restricted to an independent monetary policy or capital account openness.

There is a close connection between global risk and a cycle in global capital flows. A measure of global risk based on the co-movement of stock market returns in 63 economies – a

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global stock market factor – provides a good proxy of the global financial cycle. This global factor, in turn, displays a strong negative correlation with global capital flows, as measured by the sum of gross capital inflows across 50 emerging economies (Chart A.4). When global risk rises, gross capital inflows decline. Financial shocks – which can be broadly interpreted as exogenous changes in the risk-bearing capacity of the financial sector – matter slightly more than US monetary policy shocks in driving global risk.

Chart A.4
Global capital flows and global risk

(left-hand scale: percentages; right-hand scale: units)
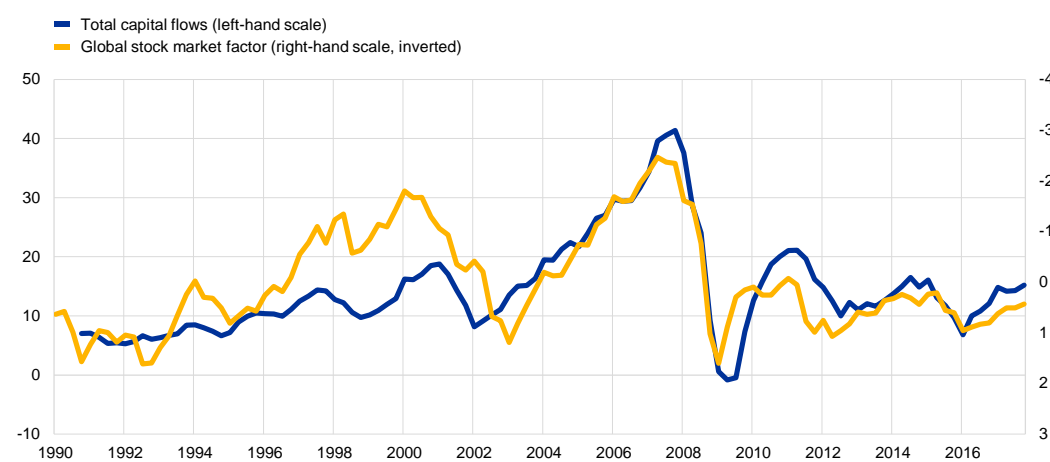
Sources: IMF Balance of Payments Statistics, Global Financial Data and authors' calculations (Habib and Venditti (2019).
Notes: Total capital gross inflows aggregated across 50 economies as a share of total GDP. The global stock market factor is constructed from stock returns for 63 countries.

A "trilemma" in the transmission of global risk to capital flows still exists. Countries that are more financially open and adopt a strict peg are more sensitive to global risk. This trilemma is largely driven by one category of cross-border flows – bank loans – thereby confirming the importance of global banks in the narrative of the global financial cycle. By contrast, portfolio flows seem to be less sensitive to global risk and completely "insensitive" to the prevailing exchange rate regime, most probably because the adjustment to risk shocks takes place through prices and not quantities.

These novel results have interesting implications for the analysis of the international transmission of monetary and financial shocks. To understand the international transmission of US monetary policy shocks, it is important to isolate their contribution to global risk. It may be difficult to establish a direct link between US monetary policy and capital flows without "passing through" global risk. Nevertheless, global risk is also driven by other shocks, in particular financial shocks, and has a large idiosyncratic component. This means that US monetary policy may not be the sole factor behind the global financial cycle.

The research also offers an interesting insight into financial stability. Domestic monetary and exchange rate policies may still influence the transmission of global risk to capital flows, especially cross-border bank loans, but not portfolio flows. As the composition of global liquidity shifts away from bank loans to other sources of funding, such as equity and bonds, sudden shifts in investors'

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attitude to risk could in fact propagate faster than in the past, through sharp fluctuations in market prices of portfolio securities, not through capital flows.

"Financial cycles: Characterisation and real-time measurement" (Schüler et al. (2019))

Financial cycles underpin countercyclical macroprudential policy regimes around the world, in particular the countercyclical capital buffer established in law in 73 different countries. Domestic financial cycles are often associated with the Basel III credit-to-GDP gap, which is prescribed as a foundational indicator to be used when setting the countercyclical capital buffer. Methodologically, the quarterly indicator is derived from a one-sided Hodrick and Prescott filter (HP filter) (1981, 1997) using a smoothing parameter of 400,000 (instead of the 1,600 commonly used). To date, a series of studies has applied the Basel III specification of the HP filter (or a related specification of the band-pass filter) to construct alternative proxies of financial cycles based, for instance, on credit or asset prices, or combinations thereof.

However, researchers have expressed concerns about the appropriateness of these methods. On the one hand, these concerns stem from the unreliable real-time properties of filters (Edge and Meisenzahl (2011)) that lead to large ex post revisions of financial cycle measures, thus adding uncertainty to the real-time calibration of macroprudential policies. On the other hand, there are concerns about spurious cycles, meaning that the filtering method a priori imposes similar durations of extracted financial cycles across countries and time (the span financial cycles require to run through a boom and bust phase; see Schüler (2018), but also Harvey and Jaeger (1993), Cogley and Nason (1995) and A'Hearn and Woitek (2001)). Spurious cycles may disguise country specificities of financial cycles that could be critical for predicting financial crises. Thus, spurious cycles might prevent the countercyclical capital buffer being set correctly.

Using credit and asset prices as inputs to the employed methodology, this research shows that constructed financial cycles significantly outperform the credit-to-GDP gap in predicting financial crises. Exploring financial cycle characteristics of G7 countries, this research finds strong evidence against a similar-duration assumption across countries. Motivated by these differences across countries, an empirical methodology for constructing country-specific financial cycles is proposed, which improves the capacity to predict a financial crisis.

Three main policy conclusions follow from this research. First, the existence of heterogeneous characteristics in financial cycles across countries stresses the importance of developing and using country-specific indicators to assess the state of a country's financial system. That said, a subset of countries exhibit strong synchronisation in their financial cycles, suggesting a need to carefully consider the prospect of spillovers and common drivers (Chart A.5). Second, the extended length and higher amplitude of financial cycles compared with business cycle counterparts support a case for policy separation – with macroprudential policy well fitted to addressing the build-up of systemic risk at the national level to complement policies aimed at business cycle stabilisation. This case is especially strong for euro area countries in which business cycles are closely linked, in contrast to marked differences in financial cycle synchronisation. Third, the linear combination of indicators – that together describes the health of balance sheets – better captures the build-up of systemic risk

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than the modelling of individual indicators or the credit-to-GDP gap. This is especially evident in a real-time setting.

Chart A.5

Correlation of country cycles with G7 cycles

■ Financial cycle (narrow)
■ Financial cycle (broad)
■ Business cycle
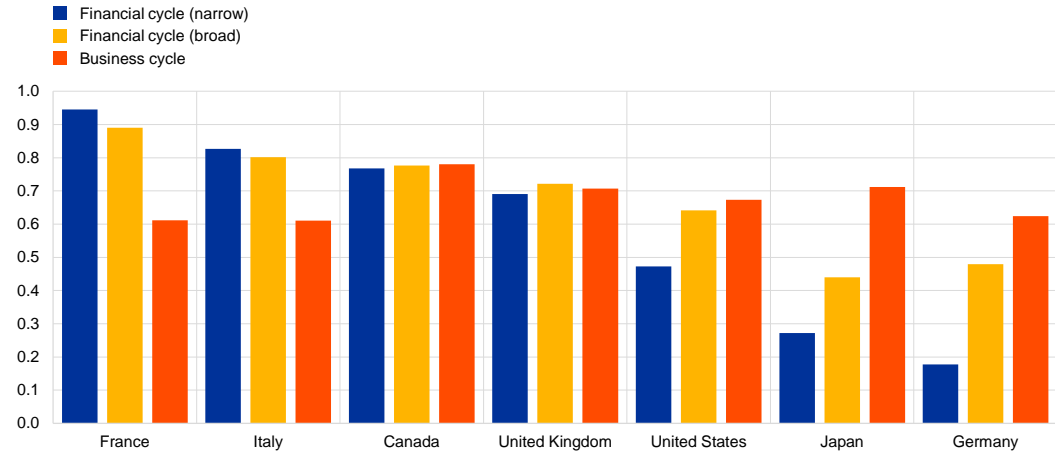
Source: Schüler et al. (2019).
Notes: The chart shows the correlation of country financial (narrow and broad) cycles and business cycles with the principal components of all G7 cycles. Countries are ordered by highest correlation of financial cycles (broad) with the G7 financial cycle (broad) principal component. "Narrow" refers to a financial cycle based on total credit and house prices. "Broad" denotes a financial cycle based on total credit, house prices, equity prices and bond prices.

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Annex 2: Methodology and data used to analyse the transmission of global risk and the role of macroprudential policy

Chart 4 shows the impact of a global risk shock on EU and other economies using the global risk measure provided by Habib and Venditti (2019) to capture the dynamics of the global financial cycle. Similar to the approach devised by Miranda-Agrippino and Rey (2019), the measure is based on a latent global stock market factor extracted from a large panel of stock market returns (63 countries).

More specifically, to measure the transmission of global risk to domestic economies the econometric framework of Alam et al. (2019) is adapted to estimate the following panel regression:

$$Y_{i,t} = \delta \sum_{k=1}^{4} Y_{i,t-k} + \beta\, global\ risk_{t-1} + \gamma \boldsymbol{X}_{i,t-1} + \propto_i + e_{i,t}, \tag{1}$$

where *i* is a country (21 advanced economies and 18 other economies) and *t* is time (quarter). The dependent variable $Y_{i,t}$ corresponds to capital flows (as percentage of GDP), the year-on-year household credit growth rate or the year-on-year growth rate in property prices.

All right-hand side variables are lagged one period to alleviate endogeneity concerns. The specification includes: four lags of the dependent variable $Y_{i,t-k}$, the lagged measure of global risk and a vector of country-specific control variables $\boldsymbol{X}_{i,t-1}$, including GDP growth, inflation and short-term interest rate changes. Finally, $\propto_i$ refers to country-fixed effects to control for any other domestic factors not captured by the control variables. Due to the invariability of the global risk indicator across countries, time-fixed effects are not included in the specification. The sample spans the period from the first quarter of 2000 to the third quarter of 2018. Table A.4 provides a summary of the dataset.

To analyse the potential role for macroprudential policy in mitigating the transmission of global risk to domestic economies (results in Table 3), the model in (1) is augmented by including an indicator variable (*macropru*) capturing the macroprudential stance for each economy which is interacted with the measure of global risk (*global risk*macropru*).

To capture the macroprudential stance, the analysis uses the aggregate indicator from the integrated Macroprudential Policy (iMaPP) database (Alam et al. (2019)) that combines data from several sources and across 17 categories of macroprudential policies. In each category, 1 represents a tightening, -1 a loosening and zero no action in a given month and country. The monthly data on the macroprudential indicator are aggregated into quarterly frequency and then cumulated over the past eight quarters (and divided by 8) to account for potential lagged and announcement effects. Due to the limited use of macroprudential policies before 2000, the data sample for the analysis of macroprudential policy effects spans the period from the first quarter of 2000 to the first quarter of 2017, which is in line with the period selected by Alam et al. (2019) and others.

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The model augmented with the macroprudential indicator reads as follows:

$$Y_{i,t} = \delta \sum_{k=1}^{4} Y_{i,t-k} + \beta\, global\ risk_{t-1} + \gamma X_{i,t-1} + \partial macropru_{i,t-1} + \delta global\ risk_{t-1}$$
$$* macropru_{i,t-1} + \propto_i + e_{i,t},$$
(2)

where ∂ captures the impact of the macroprudential stance on the dependent variable (household credit growth or property price growth). The main coefficient of interest is δ: positive values of the coefficient would indicate that a tighter macroprudential stance could mitigate the transmission of global risk shocks to domestic economies.

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Table A.4

Overview of the dataset

Panel A: Country coverage
Advanced economies: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States
Other economies: Brazil, Chile, China, Colombia, Czech Republic, Hungary, India, Indonesia, Israel, Malaysia, Mexico, Pakistan, Philippines, Poland, Russia, South Africa, South Korea, Thailand, Turkey

Panel B: Variable description and sources		
Variable	**Description**	**Source**
Gross capital inflows (% of GDP)	Four categories are considered: (i) foreign direct investment, (ii) portfolio equity, (iii) portfolio debt and (iv) other investments comprising mainly banking flows. Total gross capital inflows are the sum of the four components.	IMF International Financial Statistics
Household credit growth (%, year on year)	Year-on-year growth rate in household credit to private non-financial sector, adjusted for breaks, domestic currency	Bank for International Settlements
Property price growth (%, year on year)	Year-on-year growth rate in the real property price index.	Bank for International Settlements
Global risk	Change in the global financial cycle indicator estimated by Habib and Venditti (2019), which is based on a global stock market factor for 63 advanced and emerging market economies similar to Miranda-Agrippino and Rey (2019). Positive changes represent an increase in global risk. By construction, the measure is standardised (mean zero and unit standard deviation).	Habib and Venditti (2019)
Macropru	Quarterly macroprudential indicator from the integrated Macroprudential Policy (iMaPP) database described in Alam et al. (2019). The country-specific indicator represents the sum of macroprudential actions for instruments in 17 categories: 1 for tightening actions, -1 for loosening actions, and zero for no change. Monthly data on the indicator is transformed into quarterly frequency and then aggregated over the past eight quarters (and divided by 8) to account for potential lagged and announcement effects.	Alam et al. (2019)
GDP and GDP growth (%, year on year)	Gross domestic product – expenditure approach, US dollars	OECD Quarterly National Accounts
Inflation (%, year on year)	Year-on-year growth rate in Consumer Price Index	IMF International Financial Statistics
Interest rate	Year-on-year change in domestic short-term (interbank) interest rates	Thomson Reuters Datastream

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Imprint and acknowlegements

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